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The Late James Fergusson.

AMONG those names in the history of architecture which are memorable rather in connexion with the study and critical elucidation of the subject than for practical achievements in the art, there are few more remarkable, few that will have left a more decided impress on the architectural thought and work of their own and of succeeding generations, than that of the clear-sighted student, historian, and critic whose death all architectural England is this week regretting. He was a brilliant representative of a class of intellect which finds its pleasure and its purpose in life not in practice, but in theory; not in carrying out actual work, but in drawing together all the information available in regard to the chosen line of study: in seeing and enabling others to see in what directions its boundaries can be extended, how its ideal can be heightened and perfected, and what are the lights which the history of the past sheds upon the problems of the present and future.

The place which Fergusson takes, and will, we think, long continue to hold, among those who have contributed to the elucidation of the subject which was his chief study, is almost unique. He is as important a writer on architecture in the modern world as Vitruvius was in the ancient world, but in a quite different sense. Vitruvius, though he was condemned by circumstances, and, perhaps, partly by his own idiosyncrasies of character (as hinted at by himself), to advise others rather than to make architecture of his own, was by education and learning a practical architect, more interested, in fact, in the practical than the artistic side of his profession, in regard to which latter his perceptions were not a little narrowed by mere scholastic pedantry. Fergusson always disavowed any claim to be an architect, in the strict sense of the word, and, in fact, understated his own perceptions and knowledge on practical points. But he possessed that power of taking a broad view of the whole subject, of perceiving the historic and æsthetic relations between architectural works widely separated in time and distance, which was the best possible qualification for the most important work which he has effected, the presentation of the history of the known architectural styles of the world in one comprehensive survey. Speaking not long since of architectural works for students, we mentioned this "History of Architecture" as standing alone in the literature of the subject. There are theoretical works on the principles of architecture which are equally broad and comprehensive in their æsthetic view; but there is none which combines, with this breadth of perception and critical insight, the multifarious illustration and criticism of all the known styles of architecture. Such a work, of course, would have been impossible for any one except in modern days, when increased facilities of communication and increased means of producing and collecting architectural illustrations, from all parts of the world, enable a writer in his study to survey architecture "from India to Peru." But it would have been equally impossible, even with all these modern advantages, to produce such a work as this, not to mention the various other studies of special points into which Fergusson entered, without that dogged perseverance and persistance in labour, that "infinite capacity for taking pains," which has been sometimes described as the most essential element of genius. The list of works, besides the chief and central one, which Fergusson has left behind him, would be a tolerably long one even if they represented only so much good literary composition and thoughtful theorising. But considering that almost every one of them deals with some subject requiring special and laborious investigation to lay the basis of the conclusions arrived at, it will be recognised that there can have been few harder and more untiring workers than their author, among the men of this generation.

Fergusson was the second son of Mr. William Fergusson, M.D., who saw a good deal of service in the early part of the century as a military surgeon, became an Inspector-General of Military Hospitals, and appears to have held enlightened and advanced views, for his time, on many questions of military and civil hygiene, and wrote on such subjects with the terseness and perspicuity which are characteristic also of his son's writings on architecture. James Fergusson, who was educated at a school at Hounslow, was intended to be, and for a time became, a working partner in a mercantile house at Calcutta with which his family were connected. The ancient architecture of India, then almost unknown ground, attracted a great deal of his attention during his residence in the country, and he finally, having made some money in his business, gave his attention to the study of architecture. His first important work was his illustrated book on the "Rock-cut Temples of India," dedicated to the Royal Asiatic Society, and the result was a personal investigation and study of that remarkable and then little known series of monuments; a book which at once threw a new light on the subject (perhaps we need not say a "new" light, for, in fact, there was little or none before), with which his name has been ever since connected. In his preface to this work he remarks on the confusion of ideas which prevailed as to the date and the architectural classification of these monuments, which, by any who had referred to them at all, had been constantly connected with those of Egypt, although, in fact, there was little resemblance architecturally, and Egypt had almost ceased to exist as a country before these works of the Indian peninsula were executed. With his peculiar turn for method and classification, he set about investigating the special characteristics of these works, distinguishing the special architectural forms and the special objects which marked out one class of structure from another; and it is an early instance of his power of seizing on and bringing out the latest resemblances of the architecture of various styles and countries, that he from the first described the Buddhist Chaitya caves as the "churches" of the region, as distinguished from the monasteries (Vihara), and even described their various parts in terms borrowed from English ecclesiology. The whole of Fergusson's subsequent architectural work, especially the "History of Architecture," is full of these suggestive comparisons between types of building usually regarded as far remote from one another, architecturally as well as topographically; this power of seeing essential resemblances beneath accidental distinctions of detail, which often enabled him to throw such a vivid and unexpected light on the meaning and *motif* of an architectural monument. It was two years after this that the book appeared which always remained his own favourite among his writings,—"The True Principles of Beauty in Art,"—a book which had absolutely no literary or commercial success whatever, and which has had, up to this day, we imagine, but few readers. It would have found a more congenial soil in France, or, perhaps, still more, in Germany. It is an exception among Fergusson's writings in being a work of pure thought, not of study; it is a metaphysical treatise, in fact, though not called by any such alarming title; and John Bull has never taken kindly to speculations of this kind. Burke's essay on the "Sublime and Beautiful," which had once a kind of success, would probably have not received so much notice had it not been for the fame which Burke subsequently gained in another department of intellectual effort, better understanded of the people. Besides, Burke hardly attempted to teach anything on the subject, or to lay down serious propositions; he only speculated and reflected in well-turned periods. Fergusson set himself to lay down a complete theory of the relation of art

to science, expressed in formulated tables in which the various arts, from cooking up to poetry, were assigned their proper places in the scale of intellectual effort and intellectual pleasure. Whether any propositions on such a subject will ever gain universal acceptance or be regarded as scientific truths, may well be doubted; but the book is one which no thoughtful reader will go through without finding matter for most interesting reflection in it. What Fergusson considered the central point in it, the central point of his intellectual life, in fact, was the broad distinction which he laid down on it between art and science. "Science is knowledge of all nature does without man's intervention; art is knowledge of all those modifications that man works on nature's productions." The passage in which he describes the occurrence of this idea to him, and the effect which it had on his view of the whole subject of knowledge, is worth quoting here:—

"In early life my mercantile pursuits kept me too close to the desk to have time for society, and having no taste for the ordinary amusements of my fellow-labourers, I sought my only distraction in reading. Like most young men, the science that charmed me most was metaphysics; but I read also a good deal of chemistry and geology; tried hard to understand crystallography; and puzzled my head with problems of mechanics and astronomy; in short, I bought any book on science my limited means would allow, and more with reference to the price than the contents, and, as was to be expected, soon read my head into a chaos, from which I in vain attempted to escape. I struggled long and hard to classify the ill-digested mass of incoherent facts with which my brain was filled, but for a long time in vain; till this division into sciences and arts broke upon me, and all became clear. It came upon me like a flash of lightning. From that time I never had any difficulty, however various my reading might be. Every new fact found at once its appropriate pigeon-hole in my brain,—nothing came amiss to me; and I am convinced that if I have two ideas more original or more worth recording than my neighbour, I owe it to the happy inspiration of that hour.

This idea once broached, I was not long in constructing tables to represent it, and these were substantially the same as those now offered. As my knowledge increased, I continued to improve them, of course; but I have never had cause to doubt the correctness of the principle or of the base on which they were originally constructed."

The appearance of the "Rock-cut Temples" in 1845 had been followed two years later by the beautifully-illustrated work, entitled "Picturesque Illustrations of Ancient Architecture in Hindostan," which seems to have been intended to give a popular interest and illustration to a subject which he had previously treated in a manner more especially addressed to architects and archæologists. It is an illustration of the activity of his mind, and the variety of subjects to which he gave his thoughts in earlier days, that in the same year as the publication of the "True Principles" he published a tolerably elaborate work on "A Proposed new System of Fortification," a subject in which he was much interested. In the same year, also, he read a paper before the Institute of Architects on "The History of the Pointed Arch," and published a small work, not much more than a pamphlet, on the British Museum, the National Gallery, and the Record Office, suggesting improvements in the planning, arrangement, and architectural design of those buildings, or, at least, showing where the architectural design might have been improved while yet there was time. His remarks on this part of the subject show that at this period he had already adopted those strong views as to the futility of expecting anything good to come out of mere architectural precedent, which he maintained throughout his life, and which are exhibited, with amusing directness, in this little book, as when he recommends that the forty-four columns should be removed from the British Museum "and be made use of to erect a peristyle temple in one of the parks."

The great work now known as the "History of Architecture" first appeared in 1855, as a two-volume book under the title the "Handbook of Architecture." Even in this form it was a very large work, embracing an immense amount of research and labour, and a great success as supplying a form of text-book of the subject that was much wanted. But the author soon perceived that more might be made of it, and ten years later it re-appeared in two much thicker and more fully-illustrated volumes as "The History of Architecture." The section on Indian architecture, as a subject on which the author had special knowledge, had occupied a rather disproportionately large space in the first edition; but this subject was now withdrawn altogether from the book, to re-appear in 1876 under the title of "History of Indian and Eastern Architecture," forming the third volume of the "History of Architecture." But previously to this, in 1862, another and remarkably interesting volume had appeared, the "History of Modern Architecture," which forms to all intents and purposes a fourth volume of the history. The division of subject here suggested is significant. Fergusson was the first to see clearly that since the days of the Renaissance, when architecture became an effort to reproduce the styles of former ages, or to work on their lines and suggestions, the art had entered on an entirely new phase, different from any which to our knowledge it had gone through before. He has succeeded in impressing this idea on his generation, so that it is now accepted as a commonplace and a matter of course by many who forget, or who never recognised, to whom they were indebted for it. Considering Fergusson's strong opinion as to the futility of architectural reproductions, his criticism on the productions of the modern period is singularly fair and well balanced. Recognising that the path taken by the architects of the modern era is essentially a false one from his point of view, he can, nevertheless, give full credit to the talent and partial originality of the architecture of this period, and do justice to genius though exhibited under what may be regarded as a mistaken system. What he does not seem to recognise is the comparative impossibility of reviving the old system and the old feeling. We are weighted now with a thousand precedents thrust upon us through our modern familiarity with styles of past ages and distant countries. We can never again work out our own original bent with the straightforward faith and ardour of those who knew no style but their own, and had no precedents and examples to disturb their singleness of aim.

We can only find space to mention the remainder of Fergusson's architectural works. An early production was his first essay on the "Topography of Jerusalem, with a Restored Plan of the Temple," published in 1847, a subject which was a favourite one with him always, and to which he returned in 1878 in his more elaborate work on the "Temples of the Jews." Of his views on the architecture of Solomon's Temple a good deal has just been said in Mr. Robins's interesting paper on the subject, the second portion of which is given in another column of this number. In 1851 appeared his work on "The Palaces of Nineveh and Persepolis Restored," and in 1862 a volume on the restoration of the Mausoleum at Halicarnassus. In 1872 he published a remarkably interesting work on the "Rude Stone Monuments" of the world, giving a comprehensive view of this subject as he had done of architecture in general in the "History"; this was followed in 1877 by a smaller work especially devoted to the consideration of the monuments of this kind in the Orkneys. In 1880 appeared a sumptuous work on the "Cave Temples of India," undertaken by him in conjunction with Mr. James Burgess, and illustrated from drawings made by the latter gentleman and his assistants during the progress of a survey in India. In 1883 appeared one of his most interesting works, "The Parthenon: an Essay on the Mode in which Light was introduced into the Temples of the Greeks and Romans," in which he summed up the reasons for his long-adopted opinion on this point, in favour of what may be called a "clearstory" method of lighting, by openings through the roof admitting light to a range of vertical windows; not skylights. Fergusson's views on this subject are well known among architects and archæologists, and considering how little actual fact there is to go upon, he may be said to have established them with a probability which is next door to certainty. His treatment of this subject is an admirable example of clear and logical reasoning.

Among the papers which Fergusson read before the Institute of Architects, and which are embodied in their Transactions, the following may be mentioned: "The Architecture of Southern India" (January 7, 1850); "The Architecture of Nineveh" (March 10, 1851); "The Architectural Splendour of the City of Beejapore" (November 27, 1854); "The Great Dome of Sultan Mohammed's Tomb at Beejapore" (December 11, 1854); "Notes on the Site of the Holy Sepulchre" (1861); "Mode in which Light was introduced into Greek Temples" (November 18, 1861); "The Erechtheum" (February 14, 1876); supplement to the same (June 23, 1879); "The Temple of Diana and the Hypæthrum of the Greeks" (January 22, 1877); and "The Temple of Diana at Ephesus" (June, 1883); the latter in relation to Mr. Wood's famous discovery. On many of these papers he bestowed a great amount of thought and care; they were often the first presentation of ideas to be subsequently worked out in a more detailed and elaborate manner; and the reading of some of them marked some memorable evenings at the Institute.

There is no doubt that in one or two cases Fergusson's ingenuity in suggesting new solutions of perplexed problems in archæology carried him a little too far; and his theory about the site of the true Constantinian Church of the Holy Sepulchre has certainly not proved itself, although the reasoning with which it was supported was so ingenious and interesting, and so admirably drawn out, that every one would regret not to have had it. In regard to this and some other of his favourite theories, he showed something of that defect which was attributed to Macaulay, and which seems indigenous with Scotchmen of ability, of being "too sure of everything," and once having formed a theory, he stuck to it through all opposition, and conceded nothing to any one. In some cases, however, this hard-headed persistence gained its end thoroughly, and opinions which were at first regarded as very questionable were finally carried by sheer dint of hammering at them till he drove them home to people. Another defect which may be mentioned in his critical dealing with architecture is, curiously enough, of an exactly opposite nature to this; it is that of being too much of an enthusiast. If the judgments on remarkable buildings in history, with which the "History of Architecture" abounds, be compared, the reader will be surprised to find how many different works of different periods he has been desired to regard as superior to anything or almost anything else that had ever been done; the writer's enthusiasm for the object of his admiration at the moment carrying him away, regardless of what he had said in the same terms elsewhere about some other buildings. This is a fault very easily pardoned; it certainly makes a book more pleasant to the reader than one in which he is always asked to hold the balance of a cold criticism. The adverse criticisms in the "History," the reasons why this or that building is wholly or partially a failure, are always worth reading; even if we differ from the author, he always sets us thinking.

Fergusson's assiduity of study did not prevent him from giving much time to society. His labours were carried on with unwearied punctuality during the earlier portion of the London day, up till about four in the afternoon. A few minutes only were allowed for lunch in the middle of the day, and with that exception the morning labours were regular and uninterrupted. Those who had the privilege of occasionally consulting him during working hours about some architectural question would find him there, seated in his admirably-arranged library, occupied over the solution of some new point in archæology, or contriving a suggestion of his own for the best means of carrying out some newly-projected public improvement. From the cabinets placed about the room, photographs and drawings of buildings and architectural details from all quarters of the earth were forthcoming, to clear

up or illustrate any point on which the visitor might ask for information, or adduce a theory of his own. Fergusson was, in fact, an eminently business-like man, and without this quality he could never have got through the work he did in the way he did it. During the period when he acted as architectural adviser to the Office of Works,—a position which for a short time held, until he found it was to degenerate into a merely nominal one, such as he could not consent to hold,—he spent much trouble in improving and refining on the official architecture. When, however, it was claimed in official quarters that a certain building, which was by no means admired, had been passed with his approval, he was careful to distinguish, and in a dry letter addressed to this journal he acknowledged that he had done his best to improve certain elevations which he had found already drawn out, and hoped he had succeeded, but what his real opinion on the design was, he added, "is known only to yours faithfully, Jas. Fergusson." We share in the regret that has been elsewhere expressed, that his remarkable combination of critical insight, business habits, and absolute honesty of purpose, were not more systematically utilised by the Government in obtaining advice and assistance about many projects on which they have often very much needed such advice. We believe it was mainly owing to him that the Wellington Monument was ever so far completed as now, when it wants only its crowning equestrian group; we are sure it was not owing to him that it was placed in its present absurd position. It was also, we believe, owing to his persistent opposition that the wild scheme of internally veneering St. Paul's with marble, with an accompaniment of mosaics in the Byzantine style, was never commenced; completed it never would have been under any circumstances.

Though, as we have said, deprecating any claim to be considered as an architect, Fergusson had one building carried out from his designs, the picture gallery for Miss North's paintings at Kew, which was very successful in fulfilling its aim, and in which his idea of the Greek method of temple-lighting was put into actual practice.

Fergusson died at the age of seventy-eight, an age which would hardly have been credited to him by those who knew his eagerness in the pursuit of every new architectural topic, and the general impression of vigour and mental energy which his measured but incisive conversation left on his hearer. He spent a long life of labour over a peculiarly fascinating subject, he has left a noble record of steady work behind him, and done much to lighten and direct the studies of many others in the same field.

SEWAGE PURIFICATION.

BY JOHN C. THRESH, D.SC.(LOND.), F.C.S., ETC.

DURING the past twenty years an immense amount of time and money has been expended in devising and testing methods of sewage purification, and the results have been altogether out of proportion to the efforts. Most unfortunately much energy has been wasted by the unscientific researches of numerous experimenters leading them to erroneous conclusions, thus placing impediments in the path of progress. Men, who neither by training nor education are adapted to undertake original investigations, are to be found enthusiastically experimenting, perfectly at random, in the hope of ultimately being by a lucky accident the discoverer of a successful solution of this great sanitary problem. Such men are encouraged by the fact that no scheme is too absurd to obtain a trial; in fact, in certain quarters it appears to be a *sine quâ non* that a system must on the face of it be impracticable to ensure its being tried. So many promising plans when practically tested have been found wanting that corporations are to be found who will, as a forlorn hope, try anything, however preposterous. In many places heavy burdens have been placed upon the ratepayers in adopting systems of sewage purification which very little investigation by an expert would have shown to be impracticable. In other cases, badly-devised experiments, only capable of giving fallacious results, have been undertaken and reports published which have proved eminently misleading and mischievous.

It is hopeless to expect that any one system of treating sewage by precipitation can be devised applicable alike for small and large towns, agricultural, mining, and manufacturing districts. Before any scheme is adopted it should be most carefully investigated as to its suitability for that particular locality; first of all in the sanitary laboratory of the town or district (and every town and district should have such a laboratory for the use of its officer of health, who, as well as being a medical man, should be a chemist), and afterwards, if it gives promise of success, let it be tried on the largest possible scale. Although a process may give fairly satisfactory results when tried on a small scale in a laboratory, it does not of necessity follow that it will prove practicable when applied to the whole sewage of a town; but, on the other hand, it is useless expecting satisfactory results on a scale of any magnitude from a system which does not succeed in the laboratory. For these reasons, then, the first experiments should be made by a chemist, and unless he reports very satisfactorily as to the results it is folly to proceed further. As a matter of fact, it is far easier to ascertain the effect of precipitants and deodorisers when working with small quantities (a few gallons) of sewage, than when experimenting with large quantities. In the former case the character of the raw sewage and of the effluent is readily ascertained; in the latter this is most difficult, the strength of the sewage flowing into the tank varying considerably from hour to hour, and generally it is possible to obtain a sample of effluent which can be relied upon as representing in composition the whole of the contents of the tank. Usually, on the large scale, it is necessary to examine many samples both of the raw and treated sewage, collected at different periods of the day, and in different seasons (wet and dry). The results being reliable, and the cost in chemicals and in labour, within reason; answers can be given to the following questions, which would enable a sound conclusion to be arrived at as to whether the system could safely be adopted.

1. Does the process remove all the suspended matter in the sewage?

2. Does it remove any considerable portion of the dissolved putrescible matter?

3. Does the sludge deposited permit of being readily removed, pressed, and dried, and what is its manurial value?

4. Can the matter added to the sewage possibly be deleterious if ever used slightly in excess of the actual requirements?

A typically perfect process would not only remove all suspended matters, but also all the putrescible soluble impurities, and yield a sludge containing the whole of the constituents of the sewage possessing manurial value. The materials used would also be inexpensive, and destitute of all noxious properties, save to the very lowest forms of animal and vegetable life. We seem as far as ever from discovering a process thus efficient, but no process should be adopted unless, after a fairly-conducted trial, the results allow of answers being given to the above questions which, with regard to our present state of knowledge, can be considered satisfactory.

A paper, published in your issue of the 26th ult., by Mr. Conder, C.E., illustrates, in a striking degree, the fallacious manner in which experiments on sewage purification are frequently conducted, and the very slender basis required by an honest enthusiast whereupon to found statements of an extraordinary character. The paper contains an account of an experiment which he says was "a practical success," demonstrating the "most important results of his new and powerful method of disinfection."

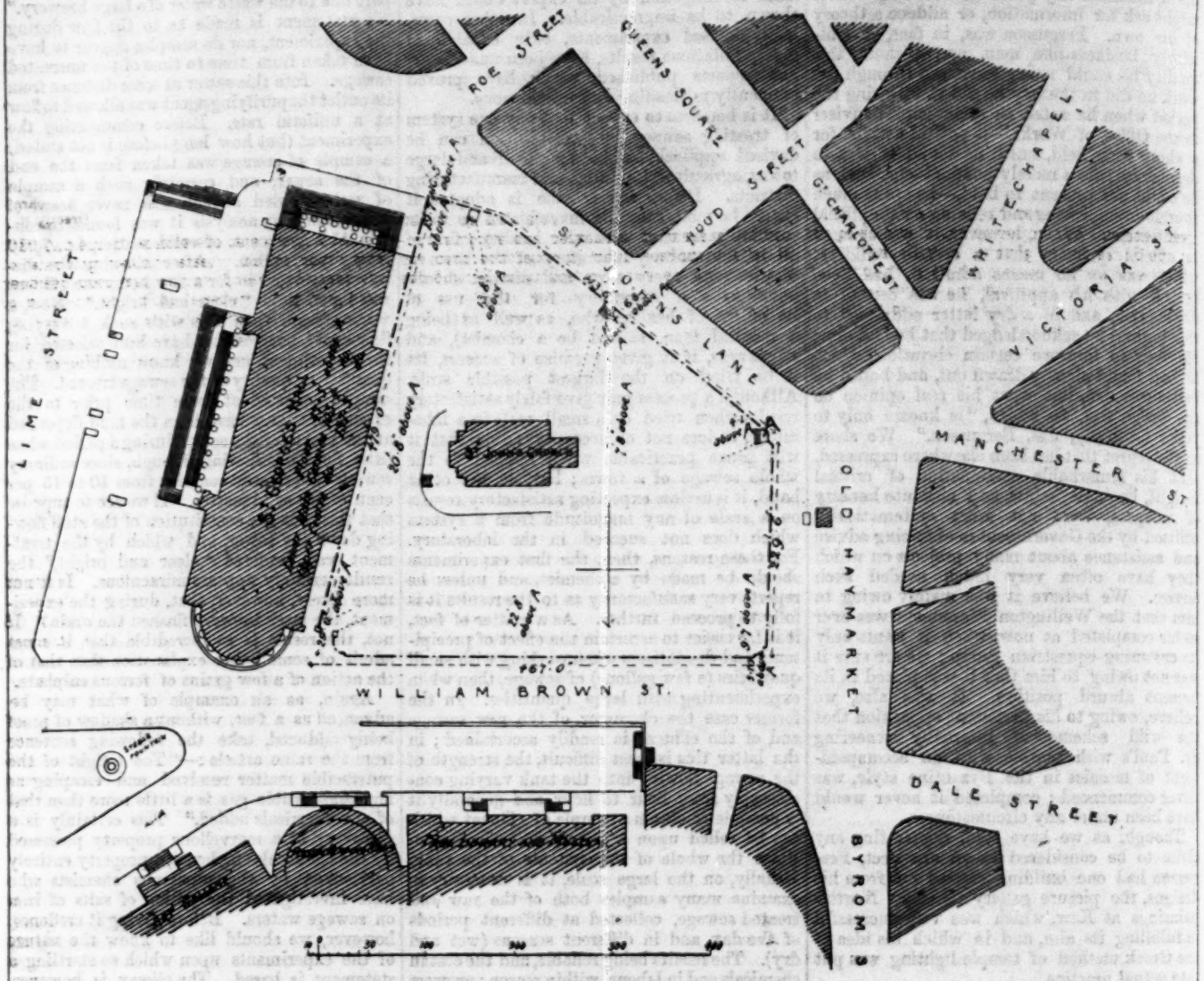
The experiment was made with a sewer in which the flow is said to be "extremely irregular, varying from almost nothing to sixty gallons per minute, the latter volume being in great part due to the waste water of a large brewery." No statement is made as to the flow during the experiment, nor do samples appear to have been taken from time to time of the untreated sewage. Into this sewer at some distance from its outlet the purifying agent was allowed to flow at a uniform rate. Before commencing the experiment (but how long before is not stated) a sample of sewage was taken from the end of the sewer, and certainly such a sample of water-carried sewage was never heard of before, since on analysis it was found to contain 11·3 per cent. of solid matter, *i.e.*, 7,910 grains per gallon. After allowing the disinfectant to run in for a few hours the effluent was found to be "clear and bright." Now, a worse stream than this with such a varying flow could not possibly have been selected for the experiment, and we know nothing of the quantity or quality of the sewage treated. The sample collected at some time prior to the experiment must have been the mud deposited at the mouth of the sewer during a period when little fluid was flowing through, since ordinary sewage sludge only contains from 10 to 15 per cent. of dry solid matter. If we are to suppose that this was the constitution of the stuff flowing down the sewer, and which by the treatment was rendered "clear and bright," the result certainly appears miraculous. Is it not more likely, however, that, during the experiment, the large brewery flushed the drain? If not, the result is so incredible that it must admit of some other explanation than that of the action of a few grains of ferrous sulphate.

Again, as an example of what may be advanced as a fact, without a shadow of proof being adduced, take the following sentence from the same article:—"The weight of the putrescible matter resolved and escaping as non-combustible gas is a little more than that of the chemicals added." This certainly is a discovery of a marvellous property possessed by the chemicals employed, a property entirely overlooked by the numerous chemists who have investigated the action of salts of iron on sewage waters. Before giving it credence, however, we should like to know the nature of the experiments upon which so startling a statement is based. The climax is, however, reached in the sentence following the one just quoted:—"Thus there is no sludge." Surely such an inference from such premisses was never before drawn.

As Mr. Conder has alluded to my correspondence with him through the columns of the *Manchester Guardian*, I may add that in answer to his claim,—that the mere addition of a small quantity of ferrous sulphate to the foulest sewage would cause it to become sweet and clear, dissipate a portion of the organic matter in the form of gas, and precipitate the remainder in a dense pulverulent form,—I showed that such results were diametrically opposed to those of all previous experimenters, and that I had carefully repeated the experiments he described with several different samples of sewage, and in all cases found the results most unsatisfactory, little or no purifying action taking place. I also pointed out the unsatisfactory character of the experiments he then recorded.

Even in experimenting with sewage scientific method cannot safely be ignored; where it is the result can only be disappointment and pecuniary loss.

Norwood.—A handsome reredos has been erected in St. Luke's Church, Norwood. The structure, which stands about 18 ft. high, is of richly-carved alabaster and marble. In the centre is a large cross with censing on either side, the "Agnus Dei" being in the centre of the cross. Above is a large gabled canopy, flanked with pinnacles and supported on corbels and twisted shafts with carved capitals, &c. The style is Gothic, of a Venetian type. The walls of the Sanctuary have also been lined with a dado of alabaster and marble. The work has been executed by Mr. N. Hitch, of Harleyford-road, Kennington, from designs prepared by Mr. Alfred Bickerdike, of Adam-street, Adelphi, W.C. The interior of the church was remodelled some years ago by the late Mr. G. E. Street.



Liverpool Cathedral: General Plan of Site.

MR. BROOKS'S DESIGN FOR LIVERPOOL CATHEDRAL.

WE propose in this and the two following numbers of the *Builder* to give in succession the main features of each design in our illustration pages, together with such passages of their authors' reports on them as may be necessary to fully explain their views. In the present number we give reproductions of as many of Mr. James Brooks's numerous drawings as we can find space for at one time. These include the plan of the ground-floor and the triforium plan, the north and south elevations (the west front having been already shown in the view we published last week), and the two large views of the interior, looking east and west respectively.

The accompanying block plan shows the site as it now exists, with the small church of St. John standing in the centre of it. The area is at present the old burial-ground or church-yard, a fact which has been adduced against its use as a site for the cathedral, and is the only argument against the site, perhaps, which is at all practically a serious one. The same difficulty has had to be faced before, however, in similar cases, and is not insurmountable, though considerations both of sanitation and sentiment will necessitate great care in the preparation of the site for its intended purpose. The east and north sides of the site, as will be seen from the figures, are the highest portions of the ground, which falls rapidly from east to west. St. George's Hall flanks the east boundary, and opposite to the northern boundary, at the further side of the street, is the group of buildings in Classical style which has gradually risen up there,—the Free Library, the Picton Reading-room, and the Walker Art Gallery.

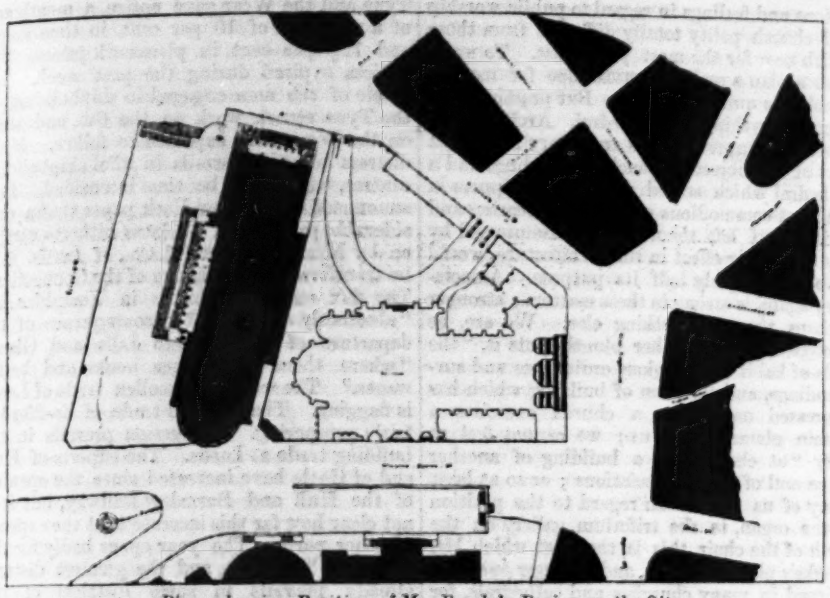
Mr. Brooks places his church at the northern boundary of the site, as shown in his small block plan subjoined, leaving the ground to the south of it clear, except for the line of subsidiary buildings which skirts a portion of it, and which is commenced from the lower level, the upper story of these buildings being on a level with the cathedral floor, or nearly so. This is a very good position for the subsidiary buildings, which thus form a kind of enclosure to the cathedral precinct, and they are kept as low as possible in order to allow of a view of St. George's Hall from Manchester-street. This object, however, will only be very partially realised, as indeed was evident in the exterior perspective we published last week.

The leading idea in regard to the proportions of the design has been to attain height, combined with a certain degree of horizontality. The site being short and surrounded by large though not very lofty buildings, the object has been to gain distinction and effect by making the cathedral rise above these horizontal-lined buildings, at the same time preserving a certain degree of horizontality by the ranges of windows, string-courses, parapets, &c., so as to harmonise to some extent with the horizontal lines of the adjacent buildings. This is Mr. Brooks's own statement as to his *motif*, and the partial horizontal effect which he describes is no doubt recognisable in the elevations we publish this week; but the geometrical elevation is a little deceptive in this respect, and the mass and projection of the buttresses, when seen in perspective, will cut through these horizontalities to some purpose; and in the west front vertical lines are certainly predominant. Though we think this point has been a little overstated in the report, however, there is no doubt that the choice of an early and severe form of Gothic does render the building a less violent contrast to its Classical surroundings than would otherwise be the case, and this is what is mainly intended. A building in an ornate Gothic style would clash curiously with the lines of St. George's Hall. But, after all, one cannot escape the incongruity by much. Look at the plain masses of masonry which constitute Mr. Brooks's buttresses, and compare them with the St. George's Hall Corinthian columns. There is not much use in trying for congruity between features which come, so to speak, from the opposite poles of architectural æsthetics.

In regard to the arrangements of the plan we now proceed to give some extracts from Mr. Brooks's report, omitting some of the points which have already been embodied in our remarks here and in the previous number:—

Plan (generally).—I place the cathedral itself on the extreme northern boundary of the site adjoining William Brown-street, having three of its principal entrances on that side. The western end is on the extreme west boundary of the site next the old Haymarket, and in the event of the present block of buildings on the west side of the Haymarket being pulled down for city improvements, a new street, forming a continuation of Dale-street, might be carried up directly to the west front, which will form a magnificent object at the end of this portion of the new street. Gateways are provided in St. John's-lane for entrances to the Cathedral-close, and thence a carriage-drive communicates with the south doorway of the transept. Opposite these doorways I would suggest the erection of a monument, on the base of which should be inscribed the names, so far as can be ascertained, of deceased persons whose remains have been interred in St. John's Churchyard; the termination of this monument to be in the form of a churchyard cross. By such a monument a record will be preserved on the spot of the names of those once interred there. Provision is made in one of the western towers for a clock-chamber, and in the other for a belfry and ringing-floor. Staircases and passages in the walls give access, as in the old examples, to all parts of the building at different levels. This is a useful provision, as by this means all parts can be approached without ladders, thus affording convenience for ventilation and repairs.

Ground Plan.—The principal object which I have



Plan, showing Position of Mr. Brooks's Design on the Site.

kept in view in designing my plan has been to obtain as great a breadth as will secure space for the accommodation of a large congregation, and so contrived that when assembled there shall be as little obstruction as possible to the sight. For this purpose aisles are added to the transepts, as well as to the nave and choir, thereby giving a very large and open space in the centre of the cathedral, and enabling a large body of people to be seated within sight and hearing of the preacher. This large and but little-obstructed space, lighted, as it will be, from a lofty central lantern, will produce, I firmly believe, a great and imposing feature in the building. The nave is intended to be 50 ft. wide, with north and south aisles each 25 ft. 6 in. wide; the north and south transepts, also the choir, will be of the same width as the nave, and each will have aisles corresponding in width with the nave aisles. The great width of the choir,—viz., 50 ft.,—gives an opportunity of providing ample accommodation for bishop, dean, canons, choristers, and congregation, such as is found in Westminster Abbey, St. Paul's Cathedral, London, and most other cathedrals in England. Eastward of the choir-gates are gates provided on the north and south sides for communicants to pass into the aisles on their return from the altar-rails without going through the choir and thus causing confusion. The choir has an apsidal end, as it has been already remarked, and an ambulatory or passage surrounds it, connecting the north and south sides, and giving access to a chapel for occasional services, on the south side, without the necessity of crossing the choir. On the north side of the choir-aisle are vestries for the bishop, dean, canons, and choristers, together with a muniment-room for the cathedral archives. Owing to the great fall that exists in the land between the eastern and western boundaries, it has been a matter of much study to fix the level of the nave floor. Considering the importance of the thoroughfare on the north side,—viz., William Brown-street,—I have decided to make one of my chief entrances from it, and to so fix the level of the nave floor that access to the building should be obtained by as few steps as possible; thus, at the easternmost door the floor will be two steps above the pavement; at the central door it will be six steps; and at the westernmost door it will be eight steps above the same level. Having settled the position of the nave floor, my next endeavour was to arrange the approach at the western entrances. To effect this I have brought forward the two western towers to the extreme western boundary of the site, and have placed them wholly outside the nave and aisle walls, by this means gaining a very great breadth for the design, and causing the façade to occupy the whole frontage of the site next the old Haymarket; this arrangement will allow of the towers, if desired, being erected after the main portion of the structure is completed. The steps are disposed within the limits fixed by the towers, and are so divided that there will be an interval of landing between every six or seven steps, and that the ascent will be rendered as easy as possible for so great an elevation; this arrangement is likely to give considerable breadth of effect. A spacious baptistery is provided on the south side at the western end of the building, and entered from the south aisle. It is placed in a semi-detached position, and leaves the western end of the cathedral quite free for worshippers, and from its position it will form a picturesque feature on the outside of the building. The wall-space beneath the windows of the aisles is a part of the structure to which I wish to direct your attention, as it is generally occupied by arcades, which are of no particular use. These I propose to divide into recesses for the reception of memorials of dignitaries of the Church, benefactors of the Church, and men of eminence generally.* I have also designated other parts of the building to receive sculptured memorials, but these will be more fully described with the plan of the triforium.

Crypt Plan.—A crypt is rendered necessary in consequence of the very great fall from east to west, and extends from the extreme western boundary of the site to the transept walls. Though permission is given by the instructions to place the chapter-house, Consistory Court, diocesan offices, and choir school in the crypt, I have not thought it desirable to do so, but have provided for all these in another position, and they will be described hereafter, with their respective plans. The appropriation of the crypt to such a purpose as that to which the crypt of St. Paul's Cathedral in London is devoted would seem to be a very suitable employment of it.

Triforium Plan.—This plan shows an arrangement for accommodating an additional number of worshippers to that provided on the ground-floor, in a triforium over the aisles of nave, choir, and transepts, which is of the same width as that of the corresponding aisles at ground-floor level; these are all well lighted, as will be seen by a reference to the plan. Particular occasions may arise,—festivals, for instance,—in a large city like Liverpool, when this additional accommodation may be very desirable. Access is obtained by spacious staircases in the angles of transepts, and at the western end of the nave. The external surfaces of the parapets next the nave, choir, and transepts appear to be specially adapted for the reception of sculptured memorials of deceased persons of eminence. The position of the organ in a building of this magnitude is a subject which requires careful consideration. It should be well raised above the floor of the choir, and a vaulted ceiling over it contributes largely to the diffusion of sound from the instrument. As the result, therefore, of a successful experience, I contemplate placing the organ in the triforium on the north side of the choir, some of its pipes being also placed in a bay of the north transept at the same level, and providing a separate staircase for its approach near the vestries.

Subsidiary Buildings.—These buildings are intended to form the enclosure of the site next St. John's-lane, and are two stories in height. The lower story, which is on the same level as that of the paving of the crypt, and which is delineated on the crypt plan, consists of the Diocesan offices, Cathedral Surveyor's office, and choir school, together with two large gateways. All these buildings are entered from the public street, and in addition the diocesan offices are connected with the lowest stage of the tower of the cathedral and the vestibule beneath the baptistery at the crypt level. The upper story of these buildings consists of a chapter-house, Consistory Court, private rooms for the bishop and the judge, and muniment-room. These floors are on the same level as the paving of the nave, and communicate with the cathedral by means of a cloister terminating with the baptistery.

North Elevation.—It will be seen from this drawing that the great central feature is the transept, having three large well-recessed portals, and these I have treated as the chief entrances from a leading thoroughfare. Westward of this transept the lowest range of window is intended to light the crypt, the next tier of windows will light the aisles, the third tier lights the triforium, while the highest are the clearstory windows. These tiers of windows are designed to give the greatest quantity of light to the interior, and at the same time to add the feature of horizontality to which I have already referred, and which is intended to harmonise with the horizontal lines of the adjacent Classic buildings. At the north-west angle of the building is one of the large towers, and at the intersection of the nave, choir, and transepts a lantern is placed, rising to a great height, and occupying a prominent central position, as will be seen from the views which illustrate this report. This lantern will throw a very large amount of light on the floor of the cathedral. On the east side of the transept are the vestries, of two stories in height, having a separate external entrance, and communicating directly with the choir aisle.

South Elevation.—The whole of this front is within the Cathedral Close, and its main features are the transept, side chapel, and baptistery. The same arrangement of windows, with the same object, has been observed on this front as well as on the north front. The use of the deeply-recessed doorways, such as is employed on the north front, has not been adopted on this front on account of the difference of aspect, and also because of the comparatively private nature of the approach.

As to the Construction.—A building of the importance of this now under consideration, and designed for so distinguished a city as Liverpool, should be constructed of materials of the most durable and lasting character, both as regards resistance to the weather and capability of supporting great weight. The materials for the walls should be of wrought or cut stone, both externally and internally; and with regard to the kind of stone, I should recommend the use of Irish limestone, which is as durable a material as could be employed for all parts of the building up to the top of the plinth. I think the same stone should be used for the piers of arcades, as its resisting powers are well known, and when wrought with a finely-picked or sanded face, its colour is most agreeable. For other portions of the building might be used such stones as Darley Dale, Hollington, the stone used at St. George's Hall, and several other stones; but, before deciding on the definite use of any particular stone, it will be well to ascertain if any one quarry could supply the requisite quantity of material for so large a fabric. For the external covering of the roofs it is intended to use lead.

The ceilings throughout are to be vaulted and groined in stone. At this place I should like to give reasons why buildings of this nature should be vaulted. (1) With a vaulted ceiling the atmosphere is less affected by the heat of summer or by the cold of winter than by any other construction. (2) With a vaulted ceiling, if from any accident the fittings took fire, the injury would be limited by it, and prevented extending to the roof; or, on the other hand, if the roof were accidentally to take fire, the destruction would be confined to this part of the building alone, as, in fact, was the case a few years ago at Canterbury Cathedral. (3) With a vaulted ceiling, a much more imposing and dignified effect is obtained than is possible with timber construction. (4) Vaulted ceilings constructed as I have designed these are by far the best for acoustic purposes, as, for instance, may be observed in the case of Westminster Abbey, which has an apsidal end. This latter circumstance has also had some influence with me in adopting the apsidal termination for the choir of this building, as an example founded on that of Westminster Abbey, whose acoustic properties are so well known, cannot fail to recommend itself.

As to the Cost.—Having gone carefully into the cost, and given due consideration to this part of the subject, and having had, moreover, a long experience in church building, many of my churches being of considerable magnitude, I am of opinion that the munificent sum provided for this work will be sufficient for the purpose, and my views are confirmed by the opinions of others who have gone with me into this matter. I have also employed Mr. John Young, a London quantity surveyor, who has for upwards of twenty years prepared quantities for the various churches and other works which I have erected during that period, to take out the quantities of the floor area, and the cubical contents as required by the instructions, and he reports the following result:—The floor area within the walls available for worshippers is 40,510 square feet, and in addition to this area there will be in the triforium 17,070 square feet, making a total of 57,580 square feet. The cubical contents of the building, calculated above the principal floor level, and including walls and projections, such as buttresses, &c., are as follow:—

Nave, aisles, choir, transepts, chapel, vestries, and baptistery	6,242,678	feet.
Towers and spires	1,099,182	,,
	7,341,860	,,
Subsidiary buildings calculated from the ground level	434,508	,,
Grand total of cubic feet	7,776,368	,,

Mr. Brooks wishes us to mention that since sending in his report he has added to it a statement pointing out that of the area of 57,580

* We may remind our readers that an arrangement similar to this is carried out, though not quite with the same continuity and completeness, in Bristol Cathedral, both in the original work, and in the modern nave added by Mr. Street.

square feet mentioned above, there is a clear and unobstructed space of 11,500 square feet within 100 ft. of the pulpit, and beyond this 100 ft. there is in the nave, aisles, and triforium 4,500 square feet, making a total of 15,000 square feet where the congregation can both see and hear the preacher.

In a future number we shall be able to give some further illustrations of this fine design. We may here point out, however, that the lantern which is shown over the crossing is, as will be seen when we have space to give the longitudinal section along with other drawings, entirely open from the church up to the groining immediately at the base of the pyramidal roof. It is divided into stages, in the first of which the square becomes an octagon, with squinches formed on an original principle, the soffits being groined from shafts attached to the face of the walls. The stage immediately above this consists of an arcade, and the two upper stages are divided by shafts carrying groined vaulting, and pierced with two windows in each stage, thus enabling a large flood of light to be thrown down, and to illuminate the whole central area.

The two interior views, that looking westward especially, show very clearly the manner in which, as we have before observed, great height is gained for the main arcade, and its lines towards the nave carried up continuously, while at the same time the intermediate arches carrying the upper aisle (for such it is rather than triforium in the ordinary sense) furnish a system of buttressing in the centre of height of the piers, obviating the necessity for increasing their mass to such a degree as to encumber the floor area too much. The practical gain of space in these upper aisles thus becomes at the same time a constructional advantage; design, convenience, and construction going hand in hand, as in all well-regulated architecture they should do. Granting that the Mediæval type is to be adopted, we think all will concur with us in thinking that this interior is a very fine example of the style, and, as far as one can shake off the recollection of the difference between Gothic as an original style and Gothic as a reproduced style, it may fairly claim to be equal to some of the finest Mediæval work. The exterior we do not so unreservedly admire in some points. The outline of the lantern might be improved; the western towers appear to us to need a little more diversification of treatment and a little more spread of outline in the lower portion. They form, to our eyes, rather too straight and vertical a line for a tower which is to culminate in a lofty spire. An Italian campanile on a great scale, which is crowned by a square lantern stage, or by only a small and subsidiary spirelet, gets much of its effect from its severe and almost chimney-like straightness, soaring right up at one bound, as it were, to the cornice. But we always feel that a tower which is crowned by a large and lofty spire should evince pyramidal leanings (if one may thus play on the word) in its own lines; the outline of the tower should seem to suggest the spire composition before the spire is arrived at, and the spire should be a natural and spontaneous fulfilment of a tendency to pyramidal composition from the base. It may be replied that this would not be so well in keeping with the period and style of Gothic adopted; and as a matter of precedent certainly it would not. The question is whether a modern architect should not attempt to make a better precedent. We forget what Roman general, when those nuisances the "augurs" told him a certain day was an unlucky one to fight on, replied, "Then I will make it a lucky one"; but the story has an application to many matters. Is a certain architectural treatment, superior in itself, "not in keeping" with the general precedent of the style adopted? Then make it in keeping. It must be observed, however, that the western towers look much better in perspective than in elevation, as indeed every tower ought to.

In regard to the plan of the church, it appears to us to be as good a compromise between practical requirements and architectural effect as can well be realised if the Mediæval plan be adopted. This form of plan arose out of conditions and feelings in regard to public worship and church polity totally different from those which now for the most part exist. To make such a plan a really practical one for modern worship is quite impossible. But practicability is not everything in a cathedral. Architectural effect and impressiveness are a very important part of the objects of such a building, and a cathedral which seated all the worshippers in the most commodious manner for hearing and seeing, and left them totally unimpressed by any dignity or effect in the architecture, would have fulfilled only half its purpose. Association, again, is strong in these matters; stronger perhaps than in anything else. We are, as Tennyson perhaps rather bluntly puts it, "the fools of habit" in religious ordinances and surroundings, and the form of building which has impressed on one as a church exercises a certain glamour over us; we cannot feel so fully "at church" in a building of another shape and of other associations; or so at least many of us think. In regard to the position of the organ, in the triforium gallery on the north of the choir, this is the best which Mr. Brooks's plan will give, and a better one than is found in many churches and cathedrals, for the combined purpose of general effect and of supporting the choir. A side position of this kind is not the place to hear a large organ from, however, and nothing will make it so. A large nave organ at the west end, and a smaller one contiguous to the choir, is the ideal arrangement. We certainly concur with Mr. Brooks in what he says about the superior safety, solidity, and architectural completeness of a vaulted roof; a large Mediæval church is not complete with a timber roof. But we cannot follow Mr. Brooks in his remarks about the acoustic properties of a vaulted roof, or the "well-known acoustic qualities" of Westminster Abbey, any more than we have sometimes been able to follow the sermon in the abbey. The fact is, when you come to build a cathedral of this shape and size and construction, you may as well leave acoustics out of the question, and let people hear as well as they can, and meditate on the architecture if they cannot. The building will produce plenty of echo, no doubt, as Westminster Abbey does; but echoes are not acoustics. A vault, with its broken-up surfaces, however, no doubt returns less concentrated echo than a dome of the same material.

Whether the Liverpool cathedral should be a Mediæval building or not depends on such a variety of considerations and influences that it is difficult to form any opinion one way or the other. It is easy enough to know what one's own predilection would be,—we have already intimated our own; but it may be reasonably urged that a cathedral should promote the greatest happiness of the greatest number of those who are to use it. Whether a modern Gothic cathedral is the form most likely to effect this end, we should feel it very rash permanently to predict. We confess to a doubt on the subject. But if it is to be supposed that it will do so, there is no doubt that the design before us has very high claims.

NOTES.

THE New-Year opens gloomily for our great industries. The Iron Trades Employers' Association have given notice that, in consequence of the depressed state of trade, and the high cost of production, the wages of all classes of workmen in their employment will be reduced about 7½ per cent. on the rates paid in the early part of 1879. Notices to this effect, to come into operation during the present month, have been given at Manchester, Liverpool, Birkenhead, Glasgow, Barrow-in-Furness, and in the Tyne and the Wear Valleys. The Committee of the Masters' Cotton-spinning Association have decided on another reduction of 5 per cent., following within three months on a similar reduction, only acceded to by the operatives after 25,000 of them had been on strike for twelve weeks. The employers state that trade has not improved since the last reduction. The master shipbuilders on the Tyne and the Wear gave notice, a month ago, of a reduction of 10 per cent. in time wages, and 12½ per cent. in piecework prices. The notices expired during the past week. The whole of the men engaged in shipbuilding on the Tyne struck work on the 6th, and those on the Wear were expected to follow. Much distress already prevails in the shipbuilding centres, which will be thus intensified. It is announced in a New York paper that a considerable part of the business hitherto carried on by Messrs. Marshall & Co., of Leeds, is to be transferred to the banks of the Connecticut. The flax and hemp hands in Yorkshire are "absolutely dying out," in consequence of the departure of the trade to Lille and Ghent, "where there are longer hours and better wages." The wool and woollen trade of Leeds is flagging. The worsted trade of Bradford is fairly prospering. Depression prevails in the building trade at Leeds. The exports of Hull and of Goole have increased since the opening of the Hull and Barnsley Railway, but it is not clear how far this increase is at the expense of other parts. The year opens badly for the trades of Yorkshire, and the greatest distress already prevails in some districts of the county.

THE sinister importance of this week's news from the heart of the iron manufacturing district is not to be disguised. On the 5th of January it transpired that a leading firm at Wolverhampton had lost a good South American order for axes, owing to German underselling. It was further stated that Wolverhampton merchants are now ordering wire and nail iron and screws of German make at greatly under Birmingham manufacturers' prices. Some little time back it was announced that Messrs. Nettlefold were about to abandon works on which they had spent 120,000*l.*, at Wellington, Salop, in order to transfer the scene of their screw-making industry to the neighbourhood of Newport, Monmouthshire. The present news shows that such a movement, intended to save the cost of railway carriage had a substantial reason; but it is far from evident that the saving thus to be effected will be enough to enable English firms to maintain the command of the market for these articles of produce. On the contrary it appears that German manufacturing prices are now so low as to be under corresponding English prices, even when the former are weighted by the cost of sea and land transfer from the German workshops to the central English market of Birmingham.

A CORRESPONDENT last week raised a question as to the ownership of drawings and plans prepared by an architect. Whether they belong to the architect or the building owner must, however, depend on the terms of the agreement between the two. It is possible for the architect to stipulate that the property in the drawings shall remain his, or for the building owner to require them to belong to him. It would be to the advantage of all parties if this were done in all cases, and the payment varied accordingly. Where no stipulation of this kind is made, we believe that "in the eye of the law" the property in the plans or drawings remains in the building owner. For the architect has been employed to prepare drawings and plans for him, and not merely for his temporary use. He may use them or burn them; he may use them immediately or at some future time. Indeed, the more the question is looked at from a practical as distinguished from a purely legal point of view, the more obvious does it appear that the legal is also the practical rule. But that we have stated the legal rule, we have no doubt. If we are not mistaken, this question arose in regard to the Houses of Parliament, with a result not favourable to Sir C. Barry's contention.

SIR B. SAMUELSON'S recent Report on the railway rates of Germany, Belgium, and Holland, as compared with those of this country, is most useful and instructive, and presents many features of interest. The agitation of last year has resulted in more light

being thrown upon this subject than all the Commissions of the past, and this exhaustive Report, which bears every evidence of careful research and reliability, must rank among the most valuable contributions to it. A large number of comparisons are made and tabulated in a concise and clear form, showing at a glance the difference between the Continental tariffs and our own. It appears that on many classes of traffic we are paying twice as much as the Germans and Dutch, and almost three times as much as the Belgians; though, in a few cases, presumably where our managers have found it quite impossible to maintain excessive rates, there is but little difference. The moral drawn by Sir Bernard is that the Continental rates are founded on intelligible principles, while ours are not. The principle here seems to be "what the traffic will bear," a system necessarily giving rise to many injustices and anomalies. There are insuperable objections to State control for our lines, but the interests of the different companies might be rendered more of a mutual and less of a competitive character by making the management more central; and it is evident that there are many expenses of administration which would be obviated by some such arrangement. But from whatever cause it arises this heavy excess in freightage handicaps our trade so severely in competing with the countries dealt with in this report that it is high time that some alteration should be effected.

IT appears from a paragraph in the *Venice Times*, an English paper published in Venice and edited by an English architect,* that an attempt is about to be made to re-unite the scattered portions of the tomb of the Doge Dandolo. At the present time the sarcophagus which contained the body is lying in the cloister of the Seminario; the arch which formerly covered it remains in the Archivio di Stato, where the monument was originally erected, and the painted spandrel of the arch is now in the sacristy of the Church of La Salute. The tomb will probably be re-erected in the Church of SS. Giovanni e Paolo, which, in return, is to give up the sculptured group belonging to the monument of Vettor Capello, which is also dispersed, but is to be put together and re-erected in some other place.

MR. R. W. CRAWFORD, the Chairman of the East Indian Railway Company, has issued a pamphlet with the motto,—

". . . . Super et Garamantas et Indos,
Proferet imperium,"

from the Æneid, in which he advocates the construction of what he calls a grand chord line from Barrakur, near Calcutta, to Moghal Serai, on the south bank of the Ganges, opposite Benares, a distance of 469 miles. The line was fully surveyed in 1850, and the details were so far worked out as to form the basis of a preliminary contract, but the Government of the day preferred the circuitous line following the valley of the Ganges, which has been carried out, and now forms the East Indian Railway. The proposed line would shorten the journey between Calcutta and Benares, and every place to the westward of the latter city, by about sixty-seven miles, and would reduce the cost of transport by that distance on all goods from all stations in the North-West to Calcutta. The line would pass very near the Kurhurbaree coal-fields, and would shorten the route for coal to the North-West by ninety-two miles, and reduce the cost of transport to the extent of 2s. 8½d. per ton. A short connexion between Gya and Sherghotty would give an alternative route of 364 miles between Patna and Calcutta, viâ Sherghotty, instead of 338 miles by the direct line and to the extent of an additional run of 26 miles render Patna and its allied stations independent of any mischief that might occur to the exposed portions of the main line near Sukieserai. Mr. Crawford deprecates the carrying out of the design for the docks to be built at Kidderpore at an estimated cost of three millions sterling, which, if the estimates be not exceeded and the work be successfully completed, will involve an annual charge of 150,000*l.* upon the trade of the port at a time when so much has been done and so much remains to be done in the way of relief in other quarters.

* Mr. W. Scott, late Travelling Student of the R.I.B.A.

FROM the Report of the Surgeon-General of the United States Navy for 1885 it appears that at the Museum of Hygiene in Washington, in connexion with the Navy Department, a complete system of iron and lead pipes, with fixtures, is being erected on the outside of the building from the ground to the roof, with an observing station at each of the three stories, for an exhaustive series of experiments covering all the topics in dispute pertaining to trap syphonage and the utility of the mechanism of water-closets, traps, water basins, baths, sinks, &c., as well as to numerous ones on which there are no reliable data, together with microscopical and chemical tests of the action of sewer air and different waters on pipes and tanks. These experiments will be conducted by Mr. Glenn Brown, the "American architect" whose account of American sanitary apparatus we have just been publishing, and he will report on the results through the returns of the Navy Medical Department.

A COMMITTEE of the Edinburgh Town Council have had under consideration a proposal by the Lord Provost that steps should be taken for the erection of new municipal buildings for the city, the present buildings having become inadequate to the requirements of the municipality. The Lord Provost appears to be in favour of the present site, in the High-street, with additions thereto from adjoining property. Other members of the Council were in favour of a site in the new town. It was agreed that inquiry should be made and a report obtained as to the capabilities of the present site, and as to the accommodation required by other public bodies located elsewere in the city which it would be desirable to concentrate in the new buildings. There is no doubt that the present site is admirably fitted for a picturesque and effective public building, but if a Town Hall is to form part of the scheme the site will be found a most inconvenient one. At all events, we trust that wherever they may be placed the new buildings will be worthy of the city.

THE old palace known as the Römer, at Frankfort, contains in its principal apartment, the Kaisersaal paintings, representing the portraits of all the German emperors from Charlemagne down to the break up of the German Empire in the year 1806. The formerly free and Imperial city of Frankfort, although shorn of much of its ancient greatness through its annexation to Prussia, still takes the utmost pride in the Römer Palace, and the treasures it contains. The municipal authorities of the city have accordingly determined to continue the practice of former times, and to add to the thousand years' series of Imperial paintings in the Hall of the Emperors, a portrait of the first emperor of the new dynasty. The work of restoring the ancient edifice of the Römer has already been taken in hand, and, as soon as this portion of the work is complete, certain alterations and fresh decorations are contemplated. The pictures already in the palace entirely cover the walls of the Imperial Hall, and, accordingly, it would have been necessary to enlarge the building in order to accommodate the portraits of the monarchs of the New German Empire. Instead, however, of making any addition to the edifice, it has been determined that the new dynasty shall be represented in the Imperial Hall, not by portraits, but by statues. It has been proposed in the Frankfort Council that the cost of placing the statues of all the German emperors of the future in the Imperial Hall shall be defrayed by the city, and that the statue of the Emperor William shall be erected there without delay.

IN the *Builder* for February 21st of last year we published a review of the new edition of "Tredgold's Carpentry" edited by Mr. Tarn, pointing out some serious, and in some cases quite inexplicable, inaccuracies in the work. We are glad to say that we have received from Messrs. Crosby Lockwood & Co. a revised copy of the new edition, accompanied by a letter stating that in consequence of our remarks they had had the work most carefully read, and had corrected the errors pointed out by us, as well as some others which were discovered on the second reading, and they have now issued the book afresh, free from these errors. The publishers have taken a very spirited course, and one highly creditable to them, in thus acting.

PLUMBING PROBLEMS.*

SUCH is the title of one out of a batch of books on sanitary subjects which has reached us from across the Atlantic. It is in the main a reprint from the *Sanitary Engineer* of questions addressed to that journal, with the editorial replies and comments thereon. This selection from a multitude of miscellaneous queries is illustrated by diagrams, and it pretty well covers the whole field of sanitary work as applied to domestic wants. The American houses are noticeable for the extent and completeness of their arrangements for warming,—a necessity of the rigorous climate,—and the inventive intellect of our cousins has been exercised in this direction, running into every variety of contrivance and expedient. An American house of the first class is, in this respect, a very complicated piece of engineering, and the provision for its working and the precautions against accident are proportionately numerous. A plumbing specification,—which strikes us as the least excellent portion of the book,—follows the section on water supply, and the whole concludes with reprints of the New York, Brooklyn, and Boston plumbing laws, which have been devised to avoid the employment of incompetent workmen, and framed so as to embody the latest conclusions of the science of sanitation.

The American nomenclature differs slightly from that in use in this country; water-closets, lavatories, &c., are "fixtures," down-pipes are "leaders," and a "back-boiler" is a "water-back,"—the term "boiler" being reserved for what we should call the circulating cistern. The irrepressible American humour shows itself even in the serious treatment of this dry subject (if we may so describe a subject in which water plays an important part); to a matter-of-fact essay on the emptying of a water-closet trap by capillary attraction, caused by the presence of a "duster," the following "moral" is appended,—"Avoid complicated fixtures, and *preserve all textile fabrics for paper stock, instead of putting them down the drains*"!

One of the most useful sections of the work is that on what are called "by-passes." It deals with a subject which is, indeed, at the root of all efficient internal drain ventilation. By a by-pass is meant such an arrangement of "fixtures" with a common trap, the attempt to ventilate which provides the foul air with an open path into the room. The rule for the prevention of this defect is given thus:—"Water should never pass through more than one trap in reaching the house-drain." If water, after passing through the trap of its own fixture, then passes through the trap of another fixture, and both traps are ventilated, there is sure to be a by-pass."

The accompanying diagram explains what is meant. It is evident that the plumber has provided, according to his lights, for the due relief of the head of each of the syphons, and if the upcast current were strong and continuous all would be well, for any foul air which might accumulate in the syphons would ascend as shown by the arrows. But alterations in temperature always render a reversal of the direction of upcast currents possible, and it is evident that a strong attraction might induce the currents in the escape-pipes along the lines indicated by the dotted arrows, and thence, by the w.c. apparatus, into the house. An "open path" is provided and would, no doubt, be occasionally followed.

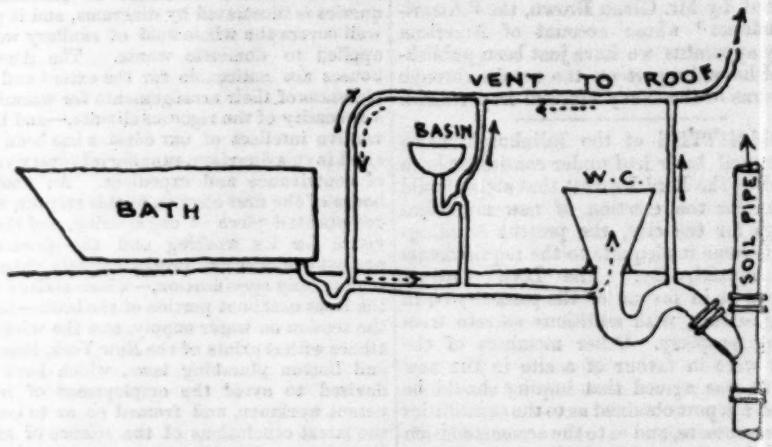
It is obvious that by somewhat similar arrangements of "fixtures" to that shown in the diagram a great variety of "by-passes" are possible, and "as a rule there will be as

* Plumbing Problems; or, Questions, Answers, and Descriptions relating to House Drainage and Plumbing, from the *Sanitary Engineer*. With 146 illustrations. New York and London: The *Sanitary Engineer*. 1885.

many 'by-passes' less one as there are traps through which one discharge has to pass in reaching the house-drain."

The examples given show that unintelligent and dishonest workmanship are as common in America as with us, and they also show that a desire to do the right thing very often ends in disaster through ignorance of sanitary principles. Much practical editorial wisdom is scattered throughout the book, and finds expression in such apothegms as "it is more important to have intelligent workmen than expensive appliances." In fact, the whole tenour of the work is in the direction of the simplification of appliances and the arrangement of them on scientific principles.

There is truth in the remark that plumbing is not often enough the subject of drawings. It is left to description and to specifications, which are by no means always specific. "Fixtures" are to be properly trapped and ventilated, and joints to be properly made, &c. Modern plumbing, as the writer justly says, is of too much importance to be done, except as all other important



constructive work is done, viz., in accordance with carefully-prepared detail drawings.

A schedule of the *desiderata* for the perfect drainage of a house scarcely differs at all from the English practice. It is not, however, provided that the sink and other wastes shall discharge over open trapped gullies outside the house, nor can it be seen from the very numerous diagrams in the book that what is in England now considered an essential of perfect drainage is so regarded in America. On the contrary, the typical specification provides for connecting all such wastes immediately with the house-drain by 2-in. cast-iron pipes with syphon traps under the "fixtures."

The treatment of hot-water circulation in houses is very copious and interesting, and numerous examples are explained and illustrated. The custom of placing the boiler on the same level or near it as the "water-back," which is fast gaining popularity in England, was first attempted in America, and it and its allied appliances have been brought in that country to great perfection.

The elaborate system of warming such palatial residences as those of Mr. W. K. Vanderbilt and Mr. Cornelius Vanderbilt, in New York, are carefully described, and present an evidence of much originality and ingenuity of arrangement, too complicated and various to explain without the help of diagrams. The annual risk to life which we experience from the bursting of kitchen-boilers is not escaped by the Americans, whose "water-backs" have the bad habit of occasionally "blowing up," notwithstanding all the precautions taken to provide against the danger.

Frost is, of course, the cause, and many expedients have been suggested and tried to prevent the consequences of frozen pipes. The Editor of the *Sanitary Engineer* distrusts spring taps and fusible plugs. "People who blow up water-backs," he says, "have very little knowledge, and would not know what to do if told that a water-back was frozen." He recommends one which is too strong to explode at all, or one which will explode at a comparatively low pressure, and so minimise the resulting damage. It is not gratifying to have to record this recommendation as the only practical solution of a question which touches the public safety. There is evidently room for a contriver of safety water-backs.

It is also found that with the vertical boilers, which have superseded our circulating cisterns, collapse sometimes occurs. The stop cock on the main is closed, and the water drawn off from the boiler, and a collapse is the consequence. But this kind of accident is perhaps inevitable, and must be borne with as beyond cure. It is fortunately not very common, and, by no means disastrous, as is the blowing up of the water-back.

The New York regulations for plumbing works recommend that all soil and other vertical pipes shall be carried up in a special shaft, which should also serve as a ventilating-shaft. It should be 2 ft. 6 in. square, and be accessible at every story, with a grating at each floor strong enough to be stood upon, and covered at the top by a louvred skylight. It is further recommended that the services should be concentrated as much as possible, and not unnecessarily scattered over the building. Both these points are attended to in English work; and, indeed, it is difficult to see in what respect the American architects have improved upon our home methods. The conditions under which they live have compelled them to adopt more extensive and elaborate measures in certain directions, but, on the whole, the English and the American practice are identical.

It is pleasant to note the *entente* which exists between the sanitarians of the two countries, and the readiness with which the excellence of English sanitary systems and appliances is recognised by our American cousins.

CHRISTIAN EMBLEMS IN ARCHITECTURE.

THE cross "carefully imprinted alike on the habitations of the living and the receptacles of the dead" will be uppermost in the minds of all who may glance at this heading.

So much in request was this great emblem of our faith at the Crusades, and so eager was each warrior to bear it on his shield, that the ingenuity of the Heralds was taxed to produce it in forms innumerable, and its varieties are more than two hundred, and some accounts even go up to three hundred, and one old writer laments, "You bring me so many crosses that I be weary of them."

The plain Latin cross is the usual form in our churches; that is, with upright limb of greater length than the cross-piece; while the Eastern church uses the Greek form, with all the limbs of same length.

St. Andrew is always accompanied by the X-form of cross on which he was condemned to be crucified. St. Philip carries the T or Tau cross, and sometimes it is represented as a double one, but not often.

We hail St. George by his shield with the red cross, and overcoming the dragon.

We know St. Peter by the inverted cross, calling to mind the form his martyrdom assumed. St. Jude also carries the cross reversed, but of the "Tau" shape.

St. Alban (the youthful martyr) carries a sword in one hand, and a cross "crosslet" (or crossed at the ends of the upper limbs) in the other.

We must not forget St. Patrick with the X-cross (or "saltire") in form as St. Andrew's, but with the colours (when shown) reversed, the former red on a white ground, and the latter white on a red ground. We find them in our "Union Jack" with that of St. George.

Occasionally we find the Latin cross upon three steps, known as "Faith, Hope, and Charity," or that of Calvary.

The Patriarchal Cross is less familiar; it is distinguished by having two cross pieces or horizontal bars.

We learn from "The Calender of the Prayer-Book" that the crucifix was first represented with Our Saviour's bust at the head or foot of the cross, and the Lamb in the centre, and that afterwards Christ Himself was represented, clothed, but not nailed; and then came the present form, with Our Lord fastened to the cross with the eyes open, and later on (from the tenth to the eleventh century) sometimes dead.

In the Greek Church, and most of the early examples, one nail fastens the feet together. In the modern Roman Church it is usual to place the feet separated, and use four nails. Formerly the figure was robed, and with a regal crown, but later examples show the crown of thorns, with only a cloth around the loins.

From the same source we gather that "the crucifix soon came to be regarded as an indispensable part of church furniture. Large representations (often with the additional figures of St. Mary and St. John) were placed over the chancel-screen (thence called the rood-loft, as the crucifix was called the rood) as well as over the church doors. The crucifix placed on the altar was generally of gold or silver, and adorned with precious stones."

Another writer observes:—"The Latin cross from its form, speaks more directly of the Atonement, representing more faithfully (probably) the very instrument on which our Lord suffered. The Greek cross, we read, rather as the emblem of Christianity in general, the religion of the Cross, expressed by its four equal arms, extending its benign influence over all the four quarters of the world."

The emblems of the Trinity are largely represented in ecclesiastical architecture in various forms, such as two triangles interlaced, or three circles intersecting each other, or a triangle within a circle; also the device setting forth its doctrine, which is met with on brasses, and now and then in windows. Foreign artists did not scruple to produce representations of the Trinity in person, but such instances are rarely to be seen in England. Three fish interlaced in the form of a triangle is another method of symbolising the "Mystical Three in One."

The emblems of the four Evangelists meet our gaze at every point, and are of great beauty and significance. Matthew is known by the angel, because his writings bear testimony to the *human nature* of our Lord. Mark, with his winged lion, will be familiar to every one as the "historian of the Resurrection"; the lion is an emblem of this important part of our faith from the old tradition that its young was brought dead into the world, and licked into life a few days after. The winged bull of St. Luke is an emblem of sacrifice, and this apostle speaks chiefly of our Saviour as a priest.

But the eagle of St. John will be the best known of the four emblems, from its constant use as a lectern, for which the outspread wings so admirably adapt it. It is said that as St. John goes beyond all other writers in contemplating the divinity of the Saviour, so the eagle soars far above the range of the feathered tribes, and gazes with undisturbed eyes upon the noonday sun.

The dove is constantly met with, and represents the Holy Ghost, and sometimes it is hovering over the waters; and again we find it with a branch in its mouth, suggesting the return to the ark, and in this conjunction coming to us as an emblem of peace to the world at large.

St. Paul with his sword (the instrument of his martyrdom), St. Peter with his key or keys, and St. Stephen, holding a stone in his hand (or some stones in his lap), hardly need referring to, so familiar must they be to all church-goers, and we pass on to speak of other saints perhaps lesser known.

We shall recognise St. Agnes by her lamb, St. Blasius by his iron comb, with which he was tortured, St. Ambrose by his bees (signifying eloquence), St. Augustine by his archbishop's pall charged with crosses, St. John the Baptist by his raiment of camel-hair. St. Martin can never be mistaken, as he sits on horseback, dividing his cloak to share it with a beggar. St. Swithin "comes home to us," as no other saint can, as the rain falls thickly around him.

St. Margaret stands on a dragon while thrusting a spear into his mouth, and St. Ann will be recognised as teaching the Virgin Mary to read. St. Laurence bears the gridiron, the instrument

of his terrible death, and St. Bartholomew the knife with which he was flayed alive.

St. Giles (the patron of cripples) has a fawn leaping up to him, and St. Michael is generally sword in hand overcoming the Evil One. St. Denis carries his head in his left hand (recording the miracle performed at his death) and a pastoral staff in his right; while St. Faith is known by her brazen bed on which she was half roasted before being beheaded. St. Simon generally carries a fish, and St. Jude a boat, in allusion to their callings. St. Leonard bears chains and fetters, and sometimes a book also. St. Hugh of Lincoln caresses a swan with one hand and holds in the other his bishop's staff.

St. Catherine will be readily recognised by the wheel that bears her name, and sometimes she is treading underfoot the Emperor Maximin, and holding a long sword.

St. Lucy carries a pair of eyes on a plate, and bears the palm branch of martyrdom. St. Nicholas is standing by a tub, from which he is bringing back to life some young children, who had been killed and salted down for eating during a dreadful famine.

St. Jerome holds a lion by the paw, and in this instance the animal represents solitude, and must not be taken for that of St. Mark.

Our Saviour is frequently represented as the Good Shepherd and carrying a lamb on His shoulders. The Lamb of God or Agnus Dei bearing a flag is considered the Christian emblem of purity.

The fish (the Greek word for which contains the initials of the names and the titles of Christ) is one of the very earliest of our Christian emblems, and fishes in general represent chastity.

The letters X and P conjoined are very familiar, and form the monogram of the name of Christ in the Greek and are to be found in the catacombs of the early Christians at Rome: the Vesica [is also supposed to be typical of the same thing, but the letters I H S are the more usual monogram, being the three first letters of the Greek word for Jesus.

LETTER FROM BRUSSELS.

BELGIUM is a country, it seems, favourable to the growth of all kinds of societies; it has been said that three Belgians cannot meet without forming a society, and truly, from what is to be seen here, one might conclude that this joke is nearer the truth than one believed.

In point of associations, Belgium possesses numerous archæological and historical societies which are scattered through the length and breadth of the land, and which study with ardour its archives, its libraries, and its museums. These studies have hitherto been carried on simultaneously in different parts of the country, without having any common meeting ground to give unity to the work, and to arrange the immense quantity of documents already collected.

The Belgian Academy of Archæology has found that it would be desirable to group all these separate elements in one federation, modelled upon the French Society for the Preservation of Monuments, founded in 1834 by M. de Caumont. The Belgian societies were therefore invited to meet from the 27th to the 31st of August last at Antwerp, to discuss the basis of the new institution.

The meeting was exceedingly well attended, and ended in the foundation of the federation and the adoption of statutes. We shall therefore have annually in Belgium a congress of archæology and history which will take place successively in each of the great cities.

As we think, the Congress of Antwerp did not give us all that we had a right to expect from a scientific point of view. The greater part of the session was taken up with the discussion of the statutes of the federation. Several very important essays, however, were read. We may particularly mention that of M. Vandengheyn upon the Aryans, that of Professor Kürth upon the rights and duties of archæological societies, that of M. Alfred Beequest, Conservateur of the Namur Museum, upon the organisation of provincial museums, and, lastly, that of M. Claes, archæologist, of Antwerp, who gave an account of his researches in the excavations occasioned by the rebuilding of the quays on the Scheldt at Antwerp. This last gentleman exhibited to the members of the Congress a collection of objects of all kinds found in the Scheldt and brought to light by the dredgers. He had specimens of the arts and industries of nearly all European nations, from the Middle Ages up to our own time.

Numerous propositions again were made, notably one tending to the acquirement by Government of the ancient Meat Market of Antwerp, dating from the fifteenth century, and the ruins of the Abbey of Villers, which include very remarkable structures of the twelfth and thirteenth centuries. These edifices are at present the property of private persons, who have the right to demolish them without its being in the power of any one to oppose them. The Congress also expressed a wish to see the numerous popular country songs brought together in one collection, as well as a list of the "*noms de lieux*" of different villages. There is really quite a study to be made of this last point, for it involves the bringing to light of the names of fields and of the inclosures which are so plentiful in the villages, an analytical examination of which would be most interesting on account of the comparisons that might be made. Let us note, in conclusion, that the assembly expressed a wish to see an album published of Flemish objects of art of which the authors and dates of execution are known. This would create a series of typical plates of the highest interest, which would without doubt be received with pleasure by the archæologists and artists throughout the country. That which had been done in this way in England, particularly the work of the Rev. Fred. Creeny, "Facsimiles of Monumental Brasses," was spoken of in eulogistic terms. M. Reuseus, professor at the University of Louvain, was elected president of the congress, assisted by a committee of patronage appointed by the Belgian Government. The next congress will take place at Naumur in 1886.

We believe that the new institution is destined to further the progress of the science of archæology in Belgium, a country of which it may well be said that it is a veritable museum.

ACTON SEWAGE AND THE METROPOLITAN BOARD OF WORKS.

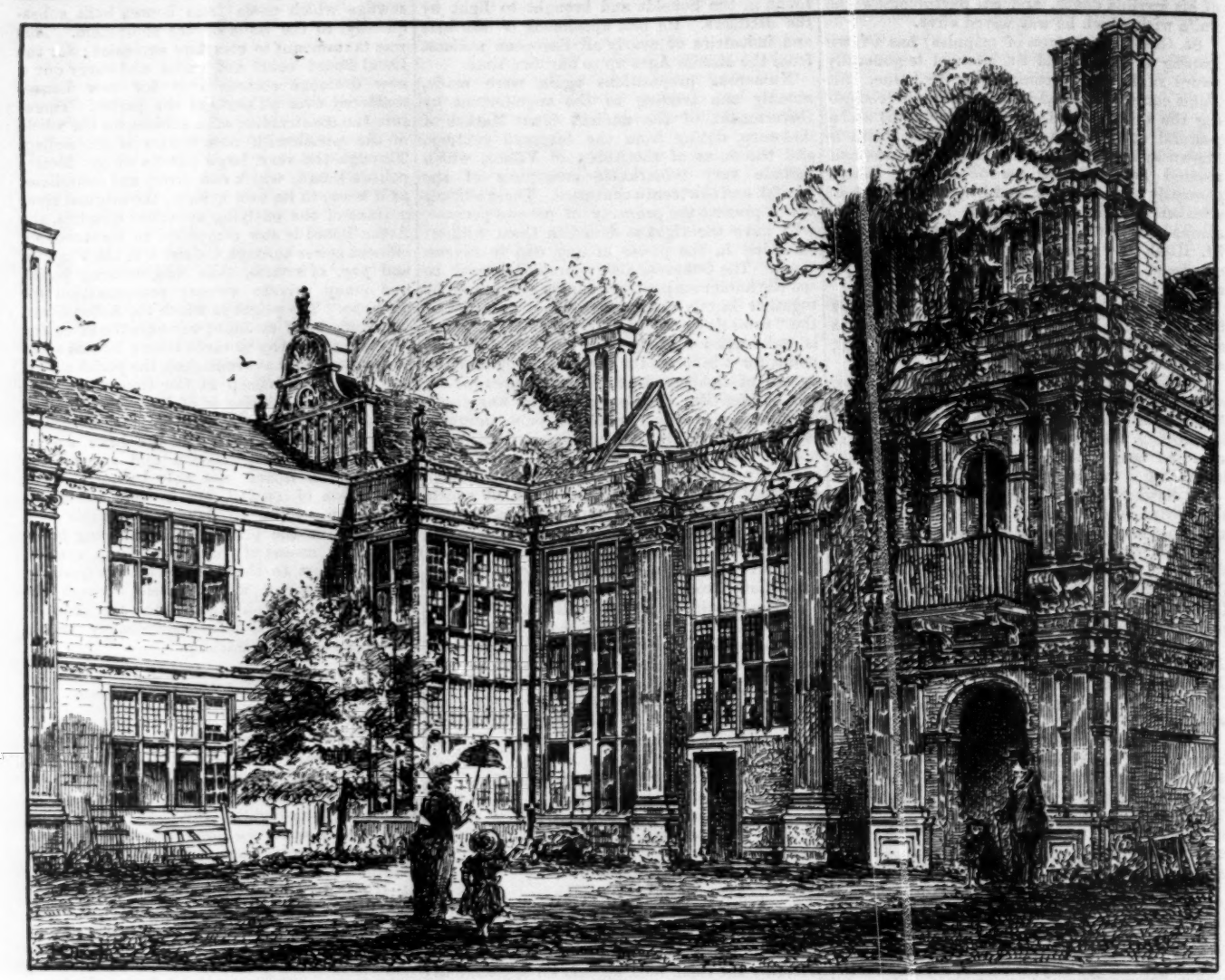
THE Metropolitan Board of Works have evidently set their face against all applications from suburban local Boards for connexion with the Metropolitan Sewage System. The Acton Board, for probably the eleventh time, has appealed to the central authority, and to its engineer, Sir Joseph Bazalgette,—who happens to be consulting engineer to the Acton Local Board,—to save the latter from the expenditure of nearly 20,000*l.* in the construction of an effluent-sewer to the River Thames in connexion with that parish's new drainage system. Sir Joseph Bazalgette has once more replied that the sewage or the effluent water from the Acton works cannot be allowed to enter the Metropolitan system; and he can suggest no other means of its disposal than by an independent covered sewer with an outfall into the River Thames. It must be admitted that proximity to the Metropolitan sewerage system has proved a serious disadvantage to some of the outlying suburban districts. Several years before the formation of many of the western district local Boards, the Metropolitan Board of Works issued notices, and laid a sewer of sufficient size apparently,—5 ft. in diameter,—for the extension of their system to Acton and Ealing; but the Metropolitan Board of Works, from some cause which does not seem to have been explained, stopped these works of extension when they came to the borders of the Acton parish. But Acton seems to have lost much more at that time than the advantage of a connexion with the Metropolitan system; the Central Authority quietly diverted to their system the Stamford Brook, which had been, it seems, from time immemorial, the sewage outfall of Acton to the River Thames. This diversion would have been a great benefit to Acton if it had been allowed to continue to run its sewage into the central system; but the Metropolitan Board soon applied for an injunction to restrain the Acton Local Board from discharging sewage into their old outlet. In the case tried, the Metropolitan Board were to a large extent successful, as they obtained an injunction, which, though it did not prohibit the Acton Board from putting the sewage of houses then in existence into the central system, it prevented the Acton authorities from disposing of, in this way, any fresh sewage which came from houses built subsequently to the issue of the injunction. This was tantamount to complete exclusion; for the Local Board could not frame and carry out a new drainage scheme only for new houses scattered over all parts of the parish. Therefore the construction of a scheme for the whole of the parish with new sewers is proceeding. Through the very large powers of the Metropolitan Board, which can divert and assimilate, as it were, to its own system, the original river outfalls of the outlying suburban districts, the Acton Board is now compelled to construct an effluent sewer through Chiswick to the Thames, and pay, of course, that neighbouring parish and many private owners compensation for doing so. The plight in which the Acton Board now finds itself no doubt warrants the extension of some sympathy towards them; but, as some of the members have remarked, the parish should not have been asleep at the time steps were being taken to deprive it of its ancient outfall to the River Thames. It may be observed, however, that Acton seems to have special claims to the consideration and aid of the Metropolitan Board, not only because of this deprivation of outfall, but because the Acton Board are willing to pay a reasonable sum annually for the privilege of disposing of its sewage by means of the Metropolitan system, and to divert to the Thames a large quantity of the rain-water which passes through the water-course in question into the central system, and which adds unnecessarily to the cost of pumping at Barking.

OBITUARY.

Mr. James Fergusson, F.R.S.—We announce with much regret the death of this distinguished writer on architecture, which occurred on Saturday last, at his residence, Langham-place, in his seventy-eighth year. In our leading article this week we have referred at some length to the principal points in his remarkable career. The funeral took place on Thursday, at Highgate Cemetery, and was attended by the Right Hon. Sir A. H. Layard, G.C.B.; Mr. John Murray, F.S.A., of Albemarle-street; Mr. T. H. Thornton, C.B., C.S.I., and Major-General Sir Frederick Goldsmid, C.B., K.C.S.I., representing the Royal Asiatic Society; Mr. A. B. Mitford, C.B., of H.M. Office of Works; Mr. F. C. Penrose, M.A., Surveyor of the Fabrick of St. Paul's Cathedral; and the undermentioned representatives of the Royal Institute of British Architects, viz.:—Mr. Ewan Christian, President; Mr. Alfred Waterhouse, R.A., Vice-President; Mr. Octavius Hansard, Member of Council; Mr. J. Macvicar Anderson, Hon. Secretary; Mr. William H. White, Secretary; Mr. Wyatt Papworth; and Mr. Hugh Stannus. Letters were received from Major-General Sir Henry Rawlinson, K.C.B., Sir Edward Colebrooke, bart., and Sir F. Burton, of the National Gallery, expressing regret at their inability to attend.

Mr. Thomas Albert Waring died on the 6th inst. at his residence, Sutton, Surrey. Originally a pupil of the late Charles Tyrrell, he formed a link between the old and new generation of surveyors. A correspondent writes of him that "though an exquisite draughtsman, colourist, and student of the Royal Academy, increasing practice early led Mr. Waring into prosaic facts. Probably his knowledge of property law generally, and all the details connected with glebes, was unrivalled. No man was more esteemed for his amiability and for his willingness to impart information to the younger race of professional men. Mr. Waring married a daughter of the late Mr. James Brown, of the fim of Boulton & Watt, and leaves no issue; he retired some years ago from the firm of Waring & Nicholson, No. 55, Parliament-street, of which he was the senior partner."

Tickhill, Yorks.—The large west window of Tickhill Church, which consists of ten chief lights and lofty tracery, has just been filled with stained glass through the munificence of the Misses Alderson, of Tickhill. The window is so arranged in design as to illustrate the entire book of Genesis, from the Creation to the death of Joseph, and it has been designed and executed by Messrs. Powell Brothers, of Leeds, who are also the artists of the five-light east window.



Kirby Hall.—South-East Corner of Inner Quadrangle.

Illustrations.

MR. JAMES BROOKS'S DESIGN FOR LIVERPOOL CATHEDRAL.

THE whole of our lithographic illustrations are this week devoted to Mr. Brooks's design for the proposed cathedral at Liverpool. For an article on the subject, see p. 116, *ante*.

KIRBY HALL.

THE accompanying sketch of the courtyard of Kirby Hall has been forwarded to us by Mr. Henry Druery, as an illustration of an old house which will be of interest in connexion with Mr. Gotch's paper on "English Houses of the Seventeenth Century," recently read at the Architectural Association, and printed in our columns. Concerning the building, Mr. Druery writes:—

"This fine example of English Renaissance was built for Lord Chancellor Hatton by John Thorpe, whose plan (preserved in the Soane collection) bears the quaint inscription 'Kerby whereof I layd ye first stone A.D. 1570.'

The north side and the outer quadrangle were altered by Inigo Jones about the year 1640 in the Italian style, and compare unfavourably with the delicacy of the earlier work. With the exception of a few rooms inhabited by an old servant the mansion is in ruins, having been dismantled about forty years ago. The sketch represents the south-east corner of the inner quadrangle with the central entrance leading into the large hall, and shows its condition in the autumn of 1884."

The Architectural Association.—In view of the proposed Italian excursion, a meeting will be held on Tuesday, the 26th inst., at 9, Conduit-street, at half-past six p.m., when the subject for discussion will be "Florence."

SOCIETY FOR THE ENCOURAGEMENT OF THE FINE ARTS.

THE twenty-seventh annual report of this Society congratulates the members upon the continual growth and the unceasing activity of the Society, and expresses a confident hope that the exertions of the Council in the future may both maintain and increase the services of the Society in the cause of art. The main object of the Society is to promote and to increase an intelligent love for the fine arts which adorn and which ennoble life. The Society affords a meeting-place for professional artists and for the non-professional but art-loving public. It works chiefly, at present, by means of exhibitions, by means of lectures, and by means of *conversazioni*. The programme for the coming session includes the following items:—Thursday, February 4th, lecture by Professor Kerr on "The Art-Scepticism of the Day"; Thursday, February 18th, lecture by Mr. Geo. C. Haité, on "The Tendencies of Modern Art"; Thursday, March 4th, lecture by Mr. W. Cave Thomas, on "The Proportions of the Human Frame"; Thursday, March 18th, Mr. Herman Merivale, on "The Drama of the Day"; Thursday, April 15th, Mr. E. P. Loftus Brock, F.S.A., on "Old Engravings of the Italian Schools"; Thursday, May 20th, Mr. G. A. Storey, A.R.A., on "The Meissoniers in Hertford House"; Thursday, June 24th, Mr. T. H. Maguire, on "The Importance of the Fine Arts to Humanity."

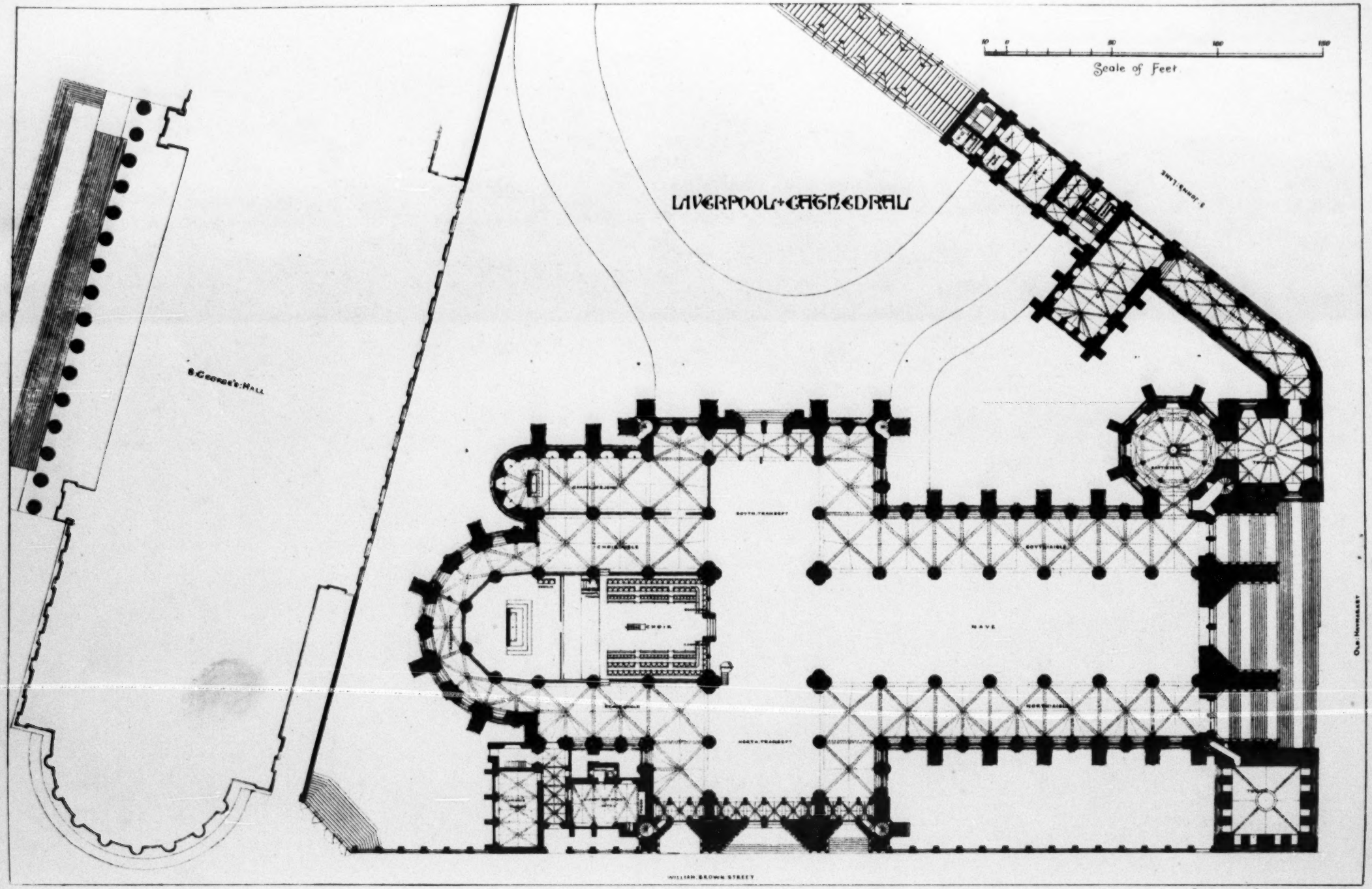
The Indian and Colonial Exhibition.—We are informed that Mr. Sam Deards, of Harlow, has secured the contract for glazing the new buildings at the forthcoming Indian and Colonial Exhibition, South Kensington, for Messrs. Lucas Bros., with some 10,000 ft. of the "Patent Victoria Dry Glazing." Mr. Deards has also been commissioned to erect a large conservatory for the Natal Government for their exotic plants and palms.

THE INSTITUTION OF CIVIL ENGINEERS.

AT the ordinary meeting on Tuesday, the 12th of January, Sir Frederick J. Bramwell, F.R.S. (President), in the chair, it was announced that the following nine *Associate Members* had been transferred to the class of *Members*:—William Armitage Brown, Thomas Penn Gaskell, George Andrew Hobson, Walter Pitt, Charles Edward Robinson, William Henry Scott, Henry Francis Sneyd-Kynnersley, William Heron Steel, and Lewis Gordon Tyrrell.

At the same meeting it was reported that the following sixteen candidates have been admitted as *Students*, viz.:—John George Barkley, Arthur Howard Benham, James Bracegirdle, Charles Robert Brady, Ernest Canning, Alfred Chatterton, B.Sc.; Thomas Cecil Daniell, Walter John Easton, Charles Frederick Vernon Ford, John Russell Frears, Arthur Edwin Trevillion Lees, Harold Medway Martin, Wh.Sc.; Walter Edward May, John Clarkson Phillips Maynard, Philip William Rygate, B.A., B.E.; and James Naismyth Sidebotham.

The monthly ballot resulted in the election of one *Honorary Member*:—Jean Charles Adolphe Alphand; of three *Members*, viz.:—The Hon. Emmanuel Lewis Galizia, Thomas Monro, and Thomas Forth Rotherham; of thirty-nine *Associate Members*, viz.:—Harvey Bagnall, B.A., Valentine John Stuart Blomfield, Harry Blundell, Walter Longley Bourke, William Henry Brinckman, Stud. Inst.C.E., Thomas Canning, Arthur Carey, David George Phillips Davies, William Dawson, Stud. Inst. C.E., Ernest Augustus Fawcus, John James Constant Fernan, James Glover, B.A., Andrew Paton Gray, William Hellier Hutchens, William Hutchinson, Robert Edward Jones, William Kingston, George Maxwell Lawford, John Randall Mann, Harold Morse, George Tod Ogilvie, Stud. Inst. C.E., Thomas Cassinet Palmer, Stud. Inst. C.E., William Penman, Thomas Sydney Pollard, Henry James Price, Alfred Ransome, James Stafford Ransome, Stud. Inst. C.E., David Campbell Rattray, Hudson Reab, Thomas Blair Reynolds, Stud. Inst. C.E., Hugh Savage, George Herbert Shaw, Wh.Sc., Stud. Inst. C.E., Edward Stables, Stud. Inst. C.E., George Richardson Strachan, Robert Henry Taylor, Gilbert Kennedy Trench, Walter Frederick Vinter, B.A., Stud. Inst. C.E., James William Welch, and Julius Wiborg; and of two *Associates*, viz.:—Henry Doulton, and William Hunter, J.P., F.G.S.



LIVERPOOL CATHEDRAL COMPETITION.—Design by Mr. Jas. Brooks F.R.I.B.A.

Ground Plan.

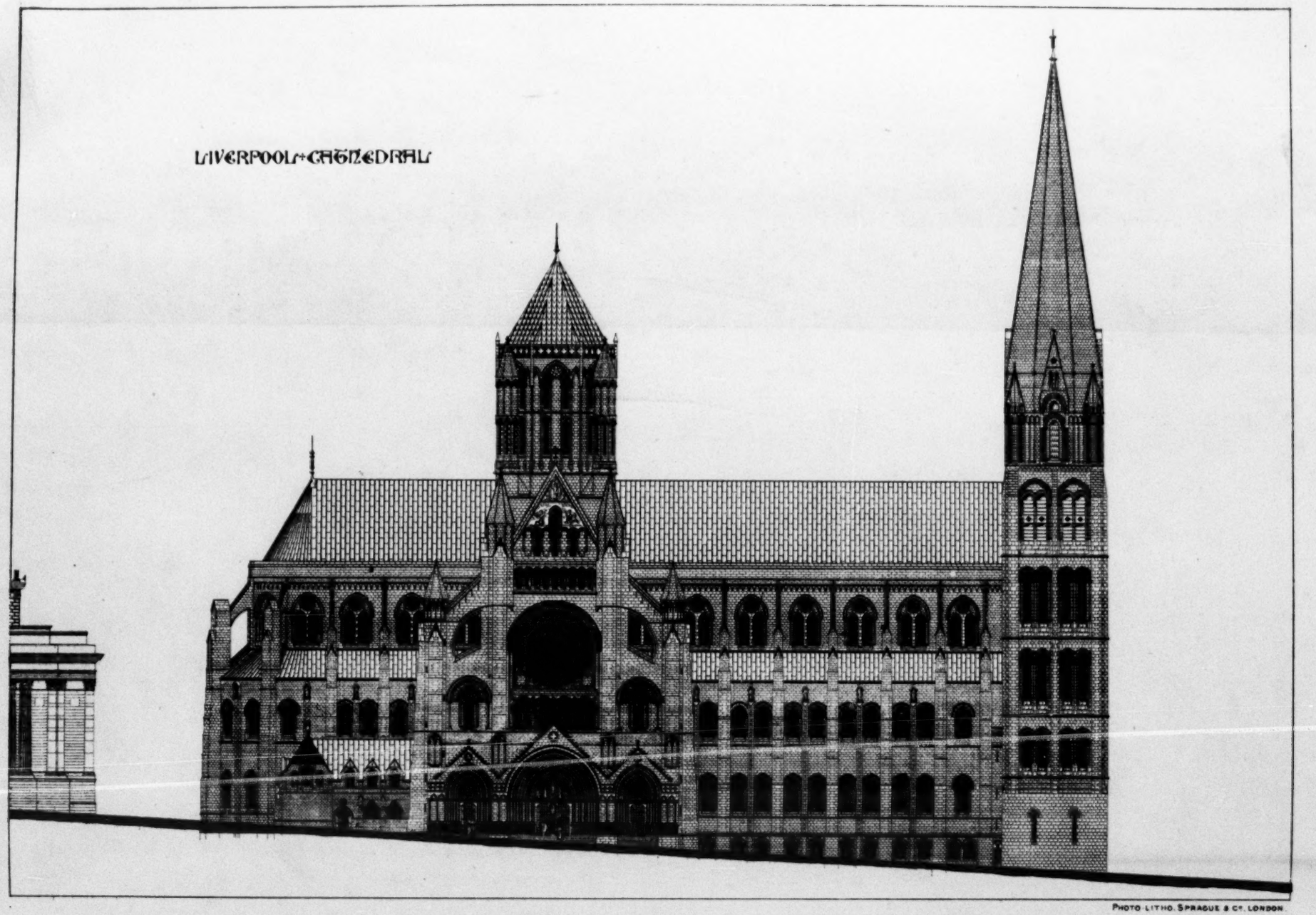
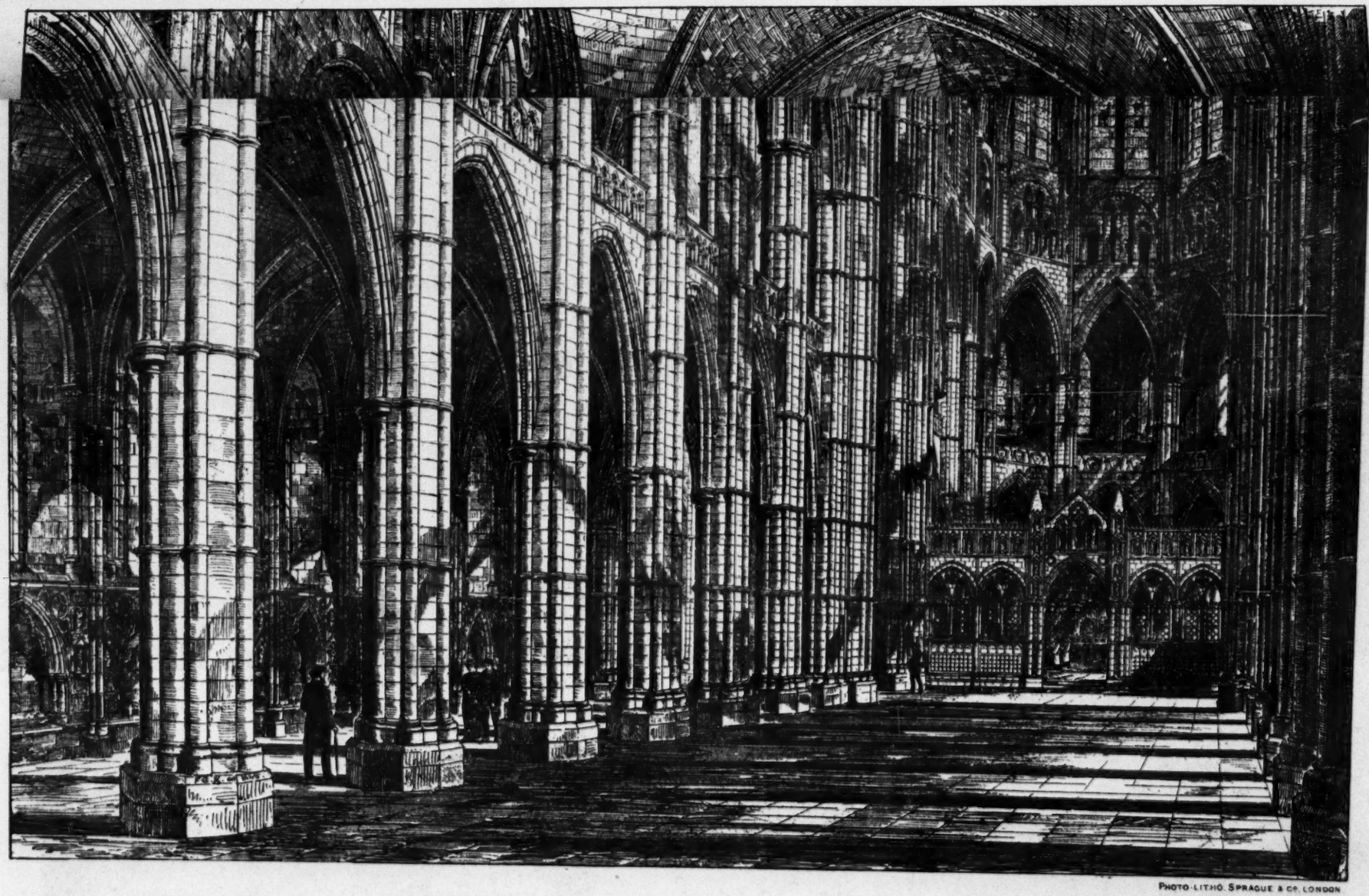


PHOTO-LITHO. SPRAGUE & Cº. LONDON.

LIVERPOOL CATHEDRAL COMPETITION.—Design by Mr. Jas. Brooks F.R.I.B.A.
North Elevation.



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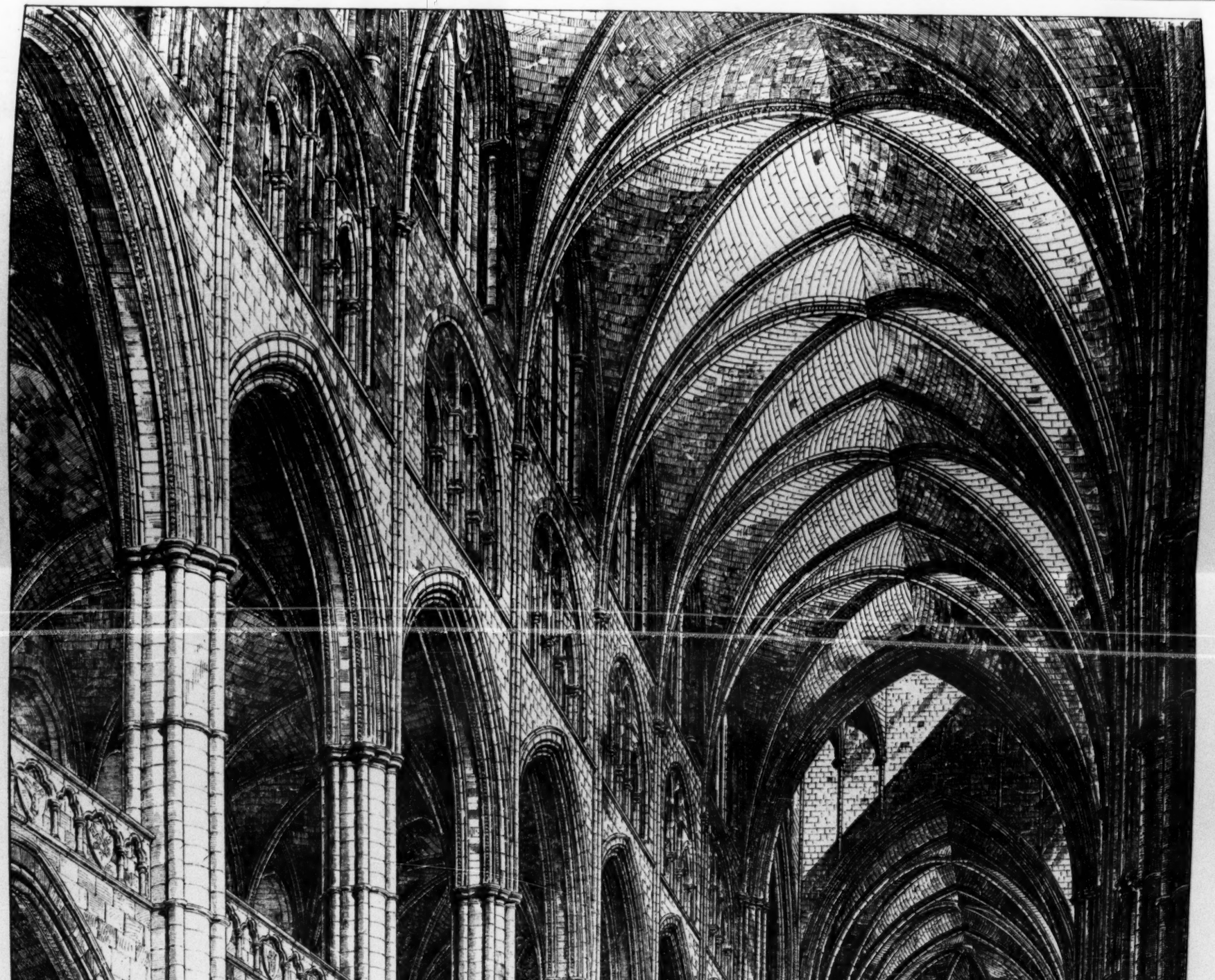
LIVERPOOL CATHEDRAL COMPETITION.—DESIGN BY MR. JAS. BROOKS F.R.I.B.A.

INTERIOR VIEW LOOKING EAST.



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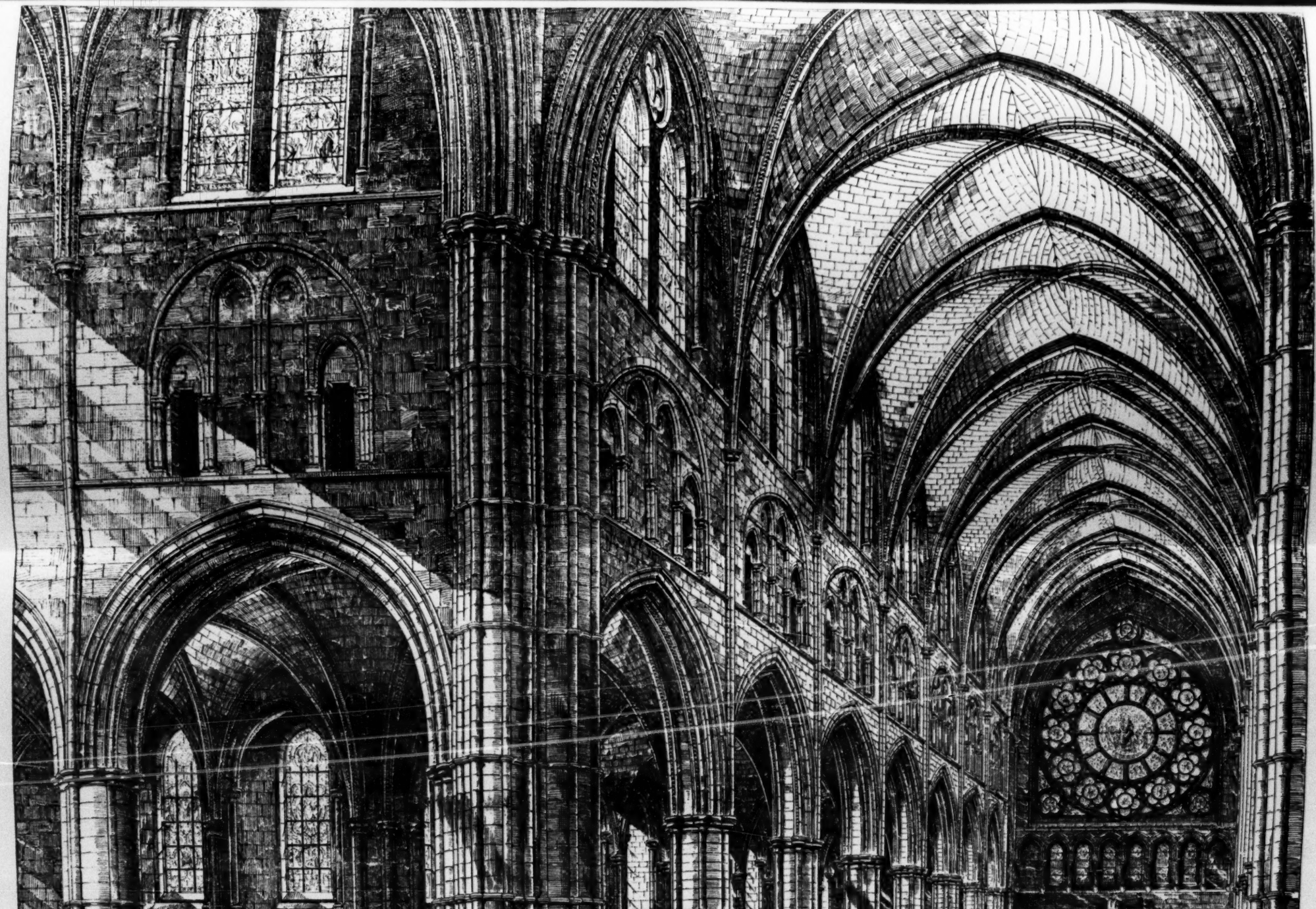
LIVERPOOL CATHEDRAL COMPETITION.—Design by Mr. Jas. Brooks F.R.I.B.A.

Interior View looking East.



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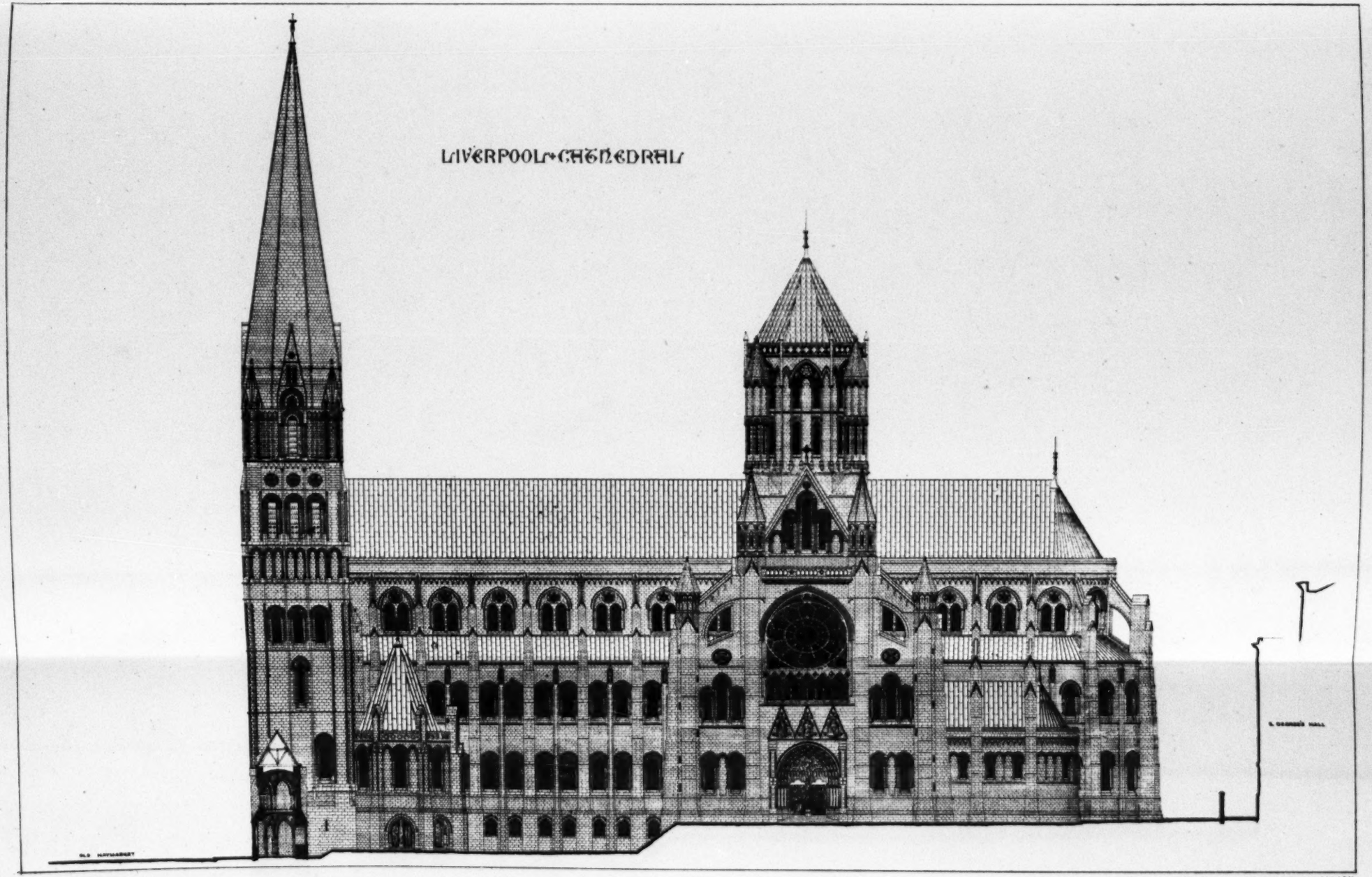
LIVERPOOL CATHEDRAL COMPETITION.—Design by Mr. Jas. Brooks F.R.I.B.A.

Interior View looking West.



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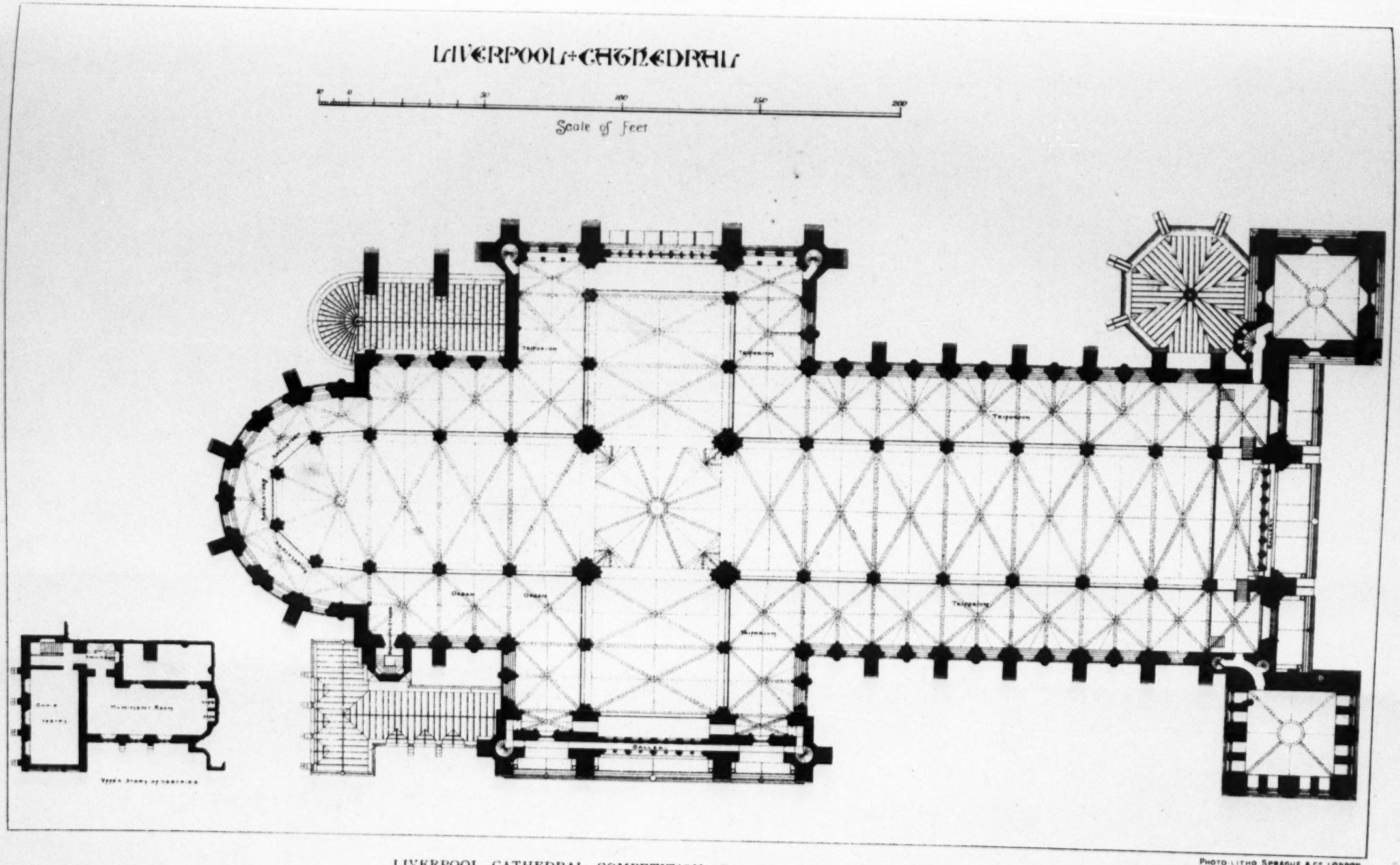
LIVERPOOL CATHEDRAL COMPETITION.—Design by Mr. Jas. Brooks F.R.I.B.A.

South Elevation.



LIVERPOOL CATHEDRAL COMPETITION.—Design by Mr. Jas. Brooks F.R.I.B.A

Triforium Plan

* Cf. Robinson, Theory of the Association of Ideas, p. 30.

THE TEMPLE OF SOLOMON.*

The Evidence of Josephus.

BEFORE we turn our attention to the third or Asiatic section of the subject, it may be desirable to notice some of Josephus's exaggerations, because of the use made of them to the prejudice of the simple description given in the sixth chapter of the 1st of Kings.

As already noticed, the Jewish historian affirms that the Temple was not 30 but 60 cubits in height, or twice the height given in Kings; and, not content with that, raises another Temple of equal dimensions above it, and thus the total internal height is made 120 cubits, or 180 ft.

The side chambers he also makes four times the height given in Kings. He speaks of no windows, but he gives the correct height to the pillars, though Chronicles seems to double that given in Kings; but they are three times mentioned as 18 cubits high,—twice in Kings and once in Jeremiah.

I have drawn to scale the description in Josephus. Its incongruity is obvious, and needs no comment.

Mr. Fergusson notices Josephus's propensity to double every dimension he can without detection. I have shown, and proceed further to indicate, where he has quadrupled them, as in the quotation made at the opening of the paper, in reference to the height of the enclosure walls above the valley.

The Book of Kings gives the height of the sanctuary and of the oracle, of the side chambers, and the pillars in the porch, the chapiters and the cherubim, the length of each wing, and the distance between their extremities; but the height of the porch itself is not specially stated, but no one has made it less than the sanctuary,* though he might very reasonably have done so.

The Book of Chronicles makes no mention of the height of the sanctuary, the oracle, or the cherubim, and the side chambers are omitted altogether; but every height that is mentioned is stated in such a way as to double or quadruple the measures given in Kings. For instance, the pillars are stated to be twice the height given in Kings, but, as suggested by Mr. Fergusson, and by Professor Wilkins before him, it is possible that Chronicles gives their united height in one measure, and I think this highly probable; at all events, let us apply this rule of interpretation to the other apparently exaggerated dimensions, and see the result.

In the 11th verse, 3rd chapter, we read, "And the wings of the cherubim were 20 cubits long." If the description had ended here, it would also have been opposed to the record in Kings, which states them to have been 5 cubits long; but just as the height of the pillars was multiplied by their number, so the length of the wings by their number.

Again, in the 13th verse, it is said that the wings of the cherubim spread themselves forth 20 cubits, or twice the width given in Kings. But in this case the explanation is given, and it is added, "One wing of the one cherub was 5 cubits, reaching to the wall of the house. The other wing was likewise 5 cubits, reaching to the wing of the other cherub," &c.

Thus, when giving the length of the wings of both cherubim, the united length of the whole four wings is given in one dimension,—a peculiar mode of expression, and calculated to mislead, where no explanation is given, as in the case of the pillars. But when taken singly a correct single dimension is given, which, in every case agrees with the Book of Kings, as in the case of the chapiters, of which it says, "And the chapiter that was upon the top of each of them was 5 cubits," the same as in Kings.

Let us apply the same rule of interpretation to the 3rd verse, 3rd chapter, of Chronicles, "And the porch that was in front of the house, the length of it was according to the breadth of the house 20 cubits, and the height was 120, and he overlaid it with pure gold."

That is to say, the height of each side of the porch which he overlaid with pure gold was 30 cubits. By adding together the height of each side of the porch, just as we added the two pillar heights and the four wing lengths, we get the figure 120 cubits as the result.

In this way the Book of Chronicles would seem to confirm the Book of Kings, and ought not, therefore, to be quoted in opposition to it.

Now, I think, it is not improbable that Josephus took advantage of this peculiar mode of expression, and invented the upper house, which is nowhere mentioned in the Bible, to elevate it to the height of the porch seemingly given in Chronicles; and as Herod, it is supposed, really did build a talar, or an upper chamber to his Temple, additional plausibility was given to the notion, and his chance of detection decreased in like proportion. We may rest assured that none of the Jews would take the trouble to prove that the Temple of their greatest sovereign was less glorious than he stated it to be.

As a set-off to this exaggeration, he makes the cherubim only half their real height, or five cubits; but this was too much to give up without taking something in return, so while the Bible says they were made of "olive tree," Josephus declares they were of "solid gold!"

The author of the article on Jerusalem in the "Encyclopædia Britannica" has also given too indulgent an ear to the story of Josephus, and in the "Biblical Atlas," published by the Religious Tract Society, the same errors are repeated and circulated.

Adopting the larger cubit measure of 1 ft. 9¾ in., it is stated that, "A porch extended along the whole eastern front of the house, which rose to the height of 210 ft. At its entrance were two great pillars, 60 ft. in height."

In fact, it is affirmed that the porch, of which the whole internal depth was 10 cubits, rose to a height exceeding by several feet the ball of fire crowning the Monument of London; and this, be it remembered, was entirely overlaid with pure gold!

It is correctly stated, however, that the Oracle or Holy of Holies of Solomon's Temple, like unto the Tabernacle, had no light, neither windows nor candlestick, and if it had had the one it would also have had the other. But "the Lord had said that he would dwell in thick darkness."

The sanctuary was lighted by ten golden, seven-branched candlesticks during the night. The necessity for windows of some kind during the day is made obvious by the fact that the candlesticks were not lighted till the evening, and remained alight only till the morning.

The command first given in Exodus is repeated in Leviticus as follows:—

"Aaron shall order it from the evening until the morning before the Lord continually," that is, continuously; every successive evening they were "to bring the pure olive oil beaten for the light to cause the lamp to burn."

Thirdly. The Asiatic.

Mr. Fergusson, in his "Historical Inquiry into the true Principles of Beauty in Art," published in 1849, makes the following remarks:—"If we take the whole breadth of Asia, from the Indus to the shore of the Ægean Sea, there does not exist in that vast, and at one time highly civilised, tract, one single remain of an ancient native temple. There are remains of the palaces of Babylon, and Nineveh and Persepolis, and tombs in thousands, both cut in the rock and structural. But of temples we only know that a temple or pyramid of Belus existed at Babylon, one dedicated to Hercules at Tyre, and a small temple at Jerusalem, concerning which we are entirely left to the verbal descriptions in the Bible."

The attempt to explain the peculiarities of the Jewish Temple by a reference to Egyptian art, Mr. Fergusson is convinced will be found to be a mistake, for he says, "There is no feature in the whole history of the Jews, ancient or modern, so remarkable as their persistence in their own singular nationality. Nothing can be more strikingly distinct than the difference between the Jewish and the Egyptian institutions.

The former never used a hieroglyph, either as a letter or the representative of a thing; on the contrary, from the very first we find them an alphabetical people, despising symbolism in all its forms, and their religion, so far from being polytheistic, or of admitting of animal worship like that of the Egyptians, was the simple and sublime monotheism of the pure Semitic races from the earliest times to the present day.

There are few things, however, in their Temple and few symbolical expressions in the Bible, which may not be explained by a reference to the sculptures of Nineveh and Persepolis, or the general modes of art or expression current upon the Euphrates" (see illustrations in last week's number).

In this early work to which I have referred, Mr. Fergusson restored the plan and section of the Temple as he then imagined it, which was not unlike that of Canina's restoration, except that he took the height given for the sanctuary as the external instead of the internal, in which, I think, he was wrong. He also diminished the thickness of the walls, and supposed the side chambers to have been open or closed galleries encircling the house, and continuing on either side in line with its face to the front, at which point he makes the following remarks:—"Whan we come to the porch or eastern façade the difficulties are so great that I question if they will ever be quite explained. The width of the porch was 20 cubits, the same as the house, its depth 10 cubits. The height is not given in Kings, but in Chronicles it is called 120 cubits. And the same book makes the height of the two pillars 35 cubits, while the book of Kings says they were only 18 cubits, showing that the one authority used the whole linear dimensions of the two objects instead of giving the height of each, which may also help us to the fact that there were two towers of 60 cubits each."

I have already shown that no real contradiction exists between the two books, but that Chronicles is confirmatory of Kings in every particular.

Mr. Fergusson proceeds to show that the raised platform upon which the Temple stood was remarkably similar to those which supported the buildings at Persepolis and Passargardæ.

At Passargardæ the platform occupied the declivity of a hill, exactly as the platform of Solomon's Temple did, having one bold and broad face rising from the plain, and two lateral ones sloping back till they met the level of the hill. The similarity in area and the remarkable resemblance in the masonry was to be observed, while the perplexing points in connexion with the chambers or cells surrounding the house, seemed to him almost set at rest since the exploration of the Palace of Darius, which brought to light the chambers surrounding the inner room.

But there remains to be noticed one peculiarity, which Mr. Fergusson believes to have existed and to have formed an essential part of the fabric, and here Mr. Fergusson shall speak for himself. He affirms that "The Temple at Jerusalem had an upper story of wood,—a talar, in short,—erected over the lower one in stone. It is true," says he, "the Bible does not mention it, but Josephus does, and with such circumstantial evidence to support it, that I conceive there can be little or no doubt about it. He first mentions it in describing the Temple as built by Solomon, and after saying 'it was 60 cubits long, 20 broad, and 60 high,' he adds, 'on the top of this was another edifice of the same dimensions,' so that the total altitude was 120 cubits." Mr. Fergusson confesses that the object the Jews had in its construction is not very evident, nor the purposes to which they applied it, and I have already exposed the incongruity of Josephus's suggestions. In his concluding remarks in 1849, Mr. Fergusson says that, "All analogies drawn from any Egyptian buildings have failed, and those derived from Classical architecture only serve to show how men may deceive themselves on such a point. An Assyrian Temple would, of course, be the best illustration, but till that is found the Persepolitan may suffice, and indeed leave very little to be desired."

In a subsequent work, entitled "The History of Architecture," Mr. Fergusson gives a plan of Solomon's Temple, which differs from his former one, as illustrated in the "Principles of Beauty." In this new plan he not only adds the chambers, instead of galleries, but places a double row of pillars to support the roof, after the Assyrian and Persepolitan examples. He says nothing about the talar, or the two towers, 75 ft. high, but concerning the internal columns, observes, "No pillars are mentioned as supporting the roof, but every analogy, as well as the constructive necessities of the case, and the fact of the existence of the two pillars in the porch, would lead us to suppose they must have existed,—four in the Holy of Holies and eight in the pronaos." (See illustrations in last week's issue.)

Mr. Fergusson does not say whether these

* Continuation of a paper by Mr. Edward Cookworthy Robins, F.S.A., entitled "A Review of the various Theories respecting the Form and Style of Architecture of the Temple of Solomon," read before the Architectural Association on January 1st, 1886. See p. 103, *ante*.

internal pillars were of bronze or cedar, but he says, "We must recollect that this was the bronze age of architecture. Homer tells us of the brazen house of Priam, and the brazen palace of Alcinous. The treasuries at Mycenæ were covered internally with bronze plates, and in Etruscan tombs of this age metal was far more essentially the material of decoration than carving in stone or any of the modes afterwards so frequently adopted. The altar of the Temple was of brass, and the molten sea supported by twelve brazen oxen. The bases, the lavers, and all the other objects and implements in metalwork were in reality what made the Temple so celebrated, and comparatively little was done to the mere masonry, by which we should judge of a Christian church or any modern building."

The latest opinions of Mr. Fergusson, after studying the subject on the spot, are given with his usual exhaustiveness and fulness of illustration, in that remarkable work published in 1878, entitled "The Temples of the Jews," wherein he treats the whole subject from the Tabernacle in the Wilderness to the glorious Temple at Jerusalem, built by Herod about a century before its final overthrow.

The only illustrated works at all comparable with Mr. Fergusson's are those of Canina and Count de Vogüé. And, while admitting the grandeur of the Herodian Temple by the latter (which requires the whole area of the modern Haram area for its display, and the summit of Mount Moriah for the site of the Sanctuary itself, tempting one to wish it might be true), it is based on conclusions which do not appear to me fairly deducible from the premises, as I have already shown.

Mr. Fergusson states his case very clearly in the new volume, and maintains his view that the Temple of Solomon was the petrifaction, as it were, of the Tabernacle extended to double the sizes, the total length being 90 cubits by 45, including the stone walls which did not exist in the Tabernacle. The verandah in the Tabernacle becoming the series of small chambers surrounding the Temple three stories in height.

He now thinks there were but five chambers on each side, and three at the end on each story, making thirty-nine in all; the total height of the chambers, including the thickness of the roofs, being about 20 cubits, or about the same height as the Holy of Holies, so that they did not obscure the windows of narrow lights required for the upper portion or clear-story walls of the Holy Place.

Constructional reasons, as well as others, give colour to his addition of internal pillars to support the roof, in the spaces between which the bases, lavers, tables, and candlesticks were placed, five on each side.

Mr. Fergusson now suggests that the pillars were not of bronze, but were the "pillars of almug trees," which Solomon made for the house, and from which Hezekiah took the golden shields to give to the Assyrians. Mr. Fergusson was not the first, however, to suggest the internal pillars; while reading in the British Museum many years ago I stumbled on an old sketch-book containing a drawing, entitled "Young Wilkins's first Sketch of the Plan of the Temple of Solomon"; it was dated 1805. I have given it among my illustrations, the pillars are shown with the tables between them. In the restoration, as I have imagined it, I have made them take their position in line with the cherubim which stood on either side of the Ark, as indicated in Canina's design, and centering with Jachin and Boaz in the porch (see illustrations in last week's issue.)

Mr. Fergusson still thinks that the 120 cubits given as the height of the porch in Chronicles, was only a duplication of the real height, from which he argues two towers 60 cubits high each, occupied by stairs which project on each side of the porch and give access to the chambers and to a room above the Sanctuary, which he thinks may have existed, and which he calls a talar, similar to that which Josephus describes, and which is so conspicuous a feature in Mr. Fergusson's restoration of the Temple of Herod. But he has only made this upper chamber 15 cubits high, not 60 cubits, as Josephus enjoined.

With reference to the pillars in the porch, called Jachin and Boaz, Mr. Fergusson has hit upon an original interpretation of great ingenuity, which is one of the curiosities of this his latest work; he now thinks it as absurd to imagine that they were huge bronze pillars with exaggerated capitals, as that they were bronze obelisks, and prefers to consider them as detached from the front of the building, forming a screen or gateway like the vine-bearing screen described by Josephus and the Talmud as existing in front of the Temple of Herod, a design for which he offers, based on the Japanese and Indian toran, like those forming gateways to the Great Tope at Sanchi.

"My impression is," says Mr. Fergusson, "that the frontispiece prepared by Hiram for Solomon's Temple consisted of two pillars of bronze, placed 12 or 14 cubits apart, and probably not more than 1 cubit in diameter, and that they had capitals 3 cubits in height and on them were placed two beams or frames of bronze each 5 cubits in height. The Septuagint calls them 'epithemata,' which cannot be construed as capitals, but may reasonably be applied to such a beam."

In this way Mr. Fergusson finds space for the net-work and chains, and pensile work, and the 400 pomegranates, 100 in a row. But, nevertheless, the porch itself is denuded of its columns.

It is curious to observe how the Grecian architect Wilkins, and the Indian architect Fergusson, respectively interpret the word epithemata, each seeing just what he wants to see and establishing its probability, but neither is supported by King's; and the resolution of the problem is yet to seek. Nevertheless, I must frankly confess that the more I study Mr. Fergusson's arguments in favour of his latest restoration, the more difficult it becomes to resist the logic of his conclusions.

Mr. Lewin takes the Asiatic side, and gives unqualified adhesion to the views expounded by Mr. Fergusson on the point of style of architecture.

Personal Conclusions.

For my own part I think with them, that it is to Asia and not to Africa or Europe we must look for the true architectural type. Nor, indeed, for the form and arrangement of the plan, this was emphatically Jewish, but for the style and forms of art adopted in details and accessories.

I think with them, that whatever was the character of the arts in Tyre, the Temple of Solomon partook of that character.

A Tyrian architect and Tyrian artisans were employed in the design and construction of the buildings at Solomon's own request, for he expressly stipulates with Hiram, the contemporary king of Tyre, that Hiram's servants should be with his servants, "For thou knowest," says he, "that there is not among us any that can skill to hew timber like unto the Sidonians."

Thus the style of art prevailing at the period in the capital of Phœnicia would, doubtless, be stamped on every part, and we are interested to know what may have been the style peculiar to Phœnicia, if indeed it was peculiar to it, seeing that there are no remains of native art existing which can be safely depended upon. What, in short, was the type of Phœnician architecture?

I think that they were not indebted to the Egyptians, but rather that they drew their ideas of art from the regions whence they migrated, and with which they held important commercial relations. Their own traditions affirm that they came from the shores of the Persian Gulf, and settled on the eastern shore of the Mediterranean sea, and immediately undertook distant voyages. Their literature has a close affinity with the Hebrew, and to them is attributed the invention of letters and their introduction to Greece.

In the Rev. Mr. Kenrick's work on Phœnicia, published in 1855, he says:—"The recent discoveries at Nineveh have brought to light inscriptions in the Phœnician character, along with others in the Cuneiform, proving an intercourse between Phœnicia and Assyria in the flourishing times of the empire of Nineveh."

Their religion, too, was closely allied to the Sun and Planet worship of the Persians, Assyrians, and Babylonians, and their Temple arrangements must have been very similar. The Jews came from Northern Mesopotamia, and the Phœnicians from Southern Mesopotamia, and both practised the rite of circumcision.

Hiram was ever a lover of David, but Pharaoh was a jealous rival, whose ambition was only temporarily satisfied by the matrimonial alliance with Solomon; and it seems scarcely probable that Hiram would have taken the same interest in the work, if Solomon's temple had been a mere reproduction of an Egyptian fane. In Solomon's time Tyre and Sidon had reached an unparalleled pitch of commercial greatness, and Mr. Kenrick observes, "The friendship of Hiram was essential to Solomon in carrying out his own commercial enterprises."

On the north, Solomon's reduction of Hamath, his building of Baalath and Tadmor in the Wildnerness, considerably increased the facilities of traffic already existing between Damascus and the Euphrates, the Tigris, Nineveh and Babylon.

The artists Hiram furnished to Solomon, for the construction and adornment of his Temple and palace, represented the skill of the nation; it comprehended every branch of art, working in gold and silver, in brass and iron, in purple and blue, in stone and timber, in fine linen and in the engraving of precious stones.

Phœnicia had inexhaustible supplies of cedar and fir. Hence it was natural that wood should be the prevailing material of Phœnician architecture, whilst it was almost banished from that of Egypt. All the internal work of Solomon's Temple, instead of sculpture, was carved work, of olive wood, cedar, and gold."

"The characteristic ornaments were of native origin," says Mr. Kenrick. "The pomegranate is not an Egyptian fruit. The gourd, whose swelling fruit supplied the place of the egg-moulding in Greek sculpture, was a native of Palestine. The palm and the lily belong quite as much to Phœnician as to Egypt. Nevertheless, within the limits of Phœnicia itself the only architectural remains which can be clearly referred to that people are foundations of walls, which from the bevelling of the joints are supposed to be Phœnician."

The closest approximation to what Phœnician art may have been, appears to be realised only in the remains of Assyrian and Persian art. Acting upon this theory, first expounded by Mr. Fergusson, I, many years ago, linked together in the sketches before you various architectural details, gleaned from the examples at Nineveh and Persepolis, adapting them to the requirements of the Temple of Solomon; but, of course, the design is but a suggestive compilation, a sort of inductive solution, yet another example in this study of architectural comparative anatomy, which I have purposely left unaltered, except as regards the internal pillars, the only addition to my original design (see illustrations).

The age of the Assyrian palaces has been variously estimated; some of them, however, are admitted to be from six to thirteen centuries before Christ; while the Persepolitan examples arose subsequently to the accession of Cyrus to the Persian throne in 560 B.C.

The points of similarity between Assyrian and Persepolitan art are sufficiently well known, especially since Mr. Fergusson completed his remarkable restorations of the former by the latter, yet I have sketched a sculpture or two to illustrate the fact; for instance, the celebrated four-winged figure of Cyrus at Passargardæ, with its inscription, "I am Cyrus the Archæmenian," contrasted with one of the four-winged figures of Assyria from the Khorsabad Palace. Also the winged bulls in front of the hall of Xerxes at Persepolis, contrasted with a winged bull from Nimroud. The identity of the style is obvious.

The walls of Persepolitan buildings, however, were not like the Assyrian palaces, cased in sculptured alabaster slabs, but only the door-posts and lintels, and window openings. The wooden roofs of both Assyrian and Persepolitan palaces have perished, but in the latter the stone pillars sustaining the same remain in great numbers, and of various design, which may reasonably be supposed to have been first employed and brought to perfection in the timber pillars of Assyrian buildings, an adaptation of which I employed in restoring "Jachin and Boaz." Hiram may have executed something akin to them in bronze, just as the Persepolitans afterwards did in stone.

The arrangement of these pillars in the porch of the Temple is precisely similar to the Persepolitan, the brazen network and pomegranates encircling the capitals and hanging over the lily-work, being most probably an original device of the Sidonians, so celebrated for their works in brass, unless we accept Mr. Fergusson's ingenious theory of an independent gateway or "Toran."

With respect to the side chambers, the Vihara at Adjuntah, and the palace of Darius

as restored by Mr. Fergusson, make these cells appear not so singular after all; and possibly they formed a series of strong rooms wherein were stored the various utensils required at the sacrifices and services of the Temple, which must have been stowed away somewhere, and may be referred to by David, when speaking of the "Treasuries and upper chambers and inner parlours thereof." Doubtless it was in one of these that Hilkiah found the book of the Lord in the reign of Josiah.

In the construction of the platform upon which the Temple and its courts were reared, the vast number of workmen must have been chiefly engaged. The outer portions of the raised platform being sustained on artificial constructions carried up from the rock at the base of the hill. The similarity in the masonry of the retaining walls of the platform, which is supposed to be visible at the south-eastern angle, and at the Wailing Place and elsewhere, to those existing at Passargardæ and Persepolis, and all Assyrian buildings, is very remarkable.

The courts of the Temple, as restored by Canina, cover an area of about 600 ft. by 400 ft. Mr. Fergusson thinks this much more than Scripture warrants as existing at the time of the dedication, at all events, who gives about 450 ft. by 350 ft. only to Solomon's time, but reaching in Herod's time to 600 ft. square. It is very probable that Solomon and his successors made many subsequent additions and improvements, but it is extremely doubtful whether the phrase, "Solomon built Millo," can possess the wide meaning given to it by Mr. Lewin, who claims the whole haram area, 1,500 ft. by 950 ft., as belonging to Solomon's time.

The court of the priests, the middle court before the house, and the great court surrounding them are each described in Chronicles, and seem to indicate no more than Fergusson or Canina have shown.

Mr. Lewin, in his "Siege of Jerusalem," p. 255, says, "The space thus] enclosed by Solomon for the outer Temple was a square, each side measuring a stadium. The dimension which the outer temple preserved to the last; within this square was another raised platform, and within that another platform still, upon which was the sacred edifice itself. These successive terraces were in imitation of the Assyrian style of architecture, which, at that time, prevailed more or less over all Syria, and particularly at Tyre."

It is said that Solomon made "a brazen scaffold 5 cubits long and broad, and 3 cubits high, and set it in the midst of the court, and upon it he stood and kneeled down on his knees before all the congregation of Israel." Therefore, the inner courts can only have been then enclosed by low walls, if any at all, else how could he have been seen by "all the congregation."

I have already referred to Canina's restoration of the brazen utensils, which were, doubtless, not dissimilar to those depicted on the arch of Titus.

I have only now to draw your attention to the details of Assyrian and Persepolitan architecture, which I pieced together in composing the design exhibited, which, as I have said, was made by me some twenty-eight years ago, and though it does not solve the problem, it remains as a record of an early attempt to do so.

The doors and windows are from the palaces at Persepolis. The upper and crowning members of the cornice are from the tomb of Darius. The lower members from the Pavilion in the Khorsabad sculptures; the similarity of the arrangement of which with the porch of Solomon's Temple is remarkable. The lower cornice is from the bas-relief El-tell-Armarna, and from the stylobate of the Temple at Khorsabad. The enrichments are from the pavement and other details from ornamental pottery at Kouyunjik. The pillars are from Persepolis, with adapted capitals and network, &c., complete, *dpropos* to which are the lines with I close my paper:—

"Godliness with contentment, these be the pillars of felicity.

Jachin, wherewithal it is established, and Boaz, in the which is strength.

And upon their capitals is lily-work, the lotus fruit and flower.

Those fair and fragrant types of holiness, innocence, and beauty.

Great gain pertaineth to the pillars, nets, and chains of wreathen gold.

And they stand up straight in the Temple porch; the place where glory dwelleth."

The President (Mr. R. Pink) in inviting discussion on the paper said that it was a most interesting one, illustrated as it was by the many drawings on the wall, and it showed evidence of great research and study.

Professor Kerr said that the subject was a very interesting one, and one which every architect of intelligence at some period of his life might be expected to speculate upon. The idea that those in the room had probably derived from Mr. Robins's description of the various designs was that the Temple was a structure of store, more or less ornamental, elegantly designed and covered in with a roof, used as a place of worship, and being surrounded with great courts in which the people assembled. Now in the time of David, the Jews were still almost entirely nomads, but David settled in Jerusalem, where he built a house. In order to do this, he sent to Tyre, where the arts were in something like an advancing condition, there being no arts amongst the Hebrews. By the help of the Tyrians, therefore, he constructed that house. Now, there were two historical types of house-building. One was the Gothic hall, which was covered in by a roof, and the other was the Eastern Court, which was primarily an enclosure by a wall. The house which David built was an enclosure of this kind, with timber buildings inside. Although David desired to build a temple for the worship of God, he was not permitted to do so, because he was a man of war, and it was left to his successor to carry out the work. Solomon proceeded to build a temple. He afterwards built a palace for himself, the plan of which they pretty well understood to be a mere court-yard enclosing a Hall of Justice and certain chambers, which, however, were scarcely used for a residence, in the present sense of the term. When Solomon proceeded to build his Temple to God he sent a message to Tyre in something like these terms:—The Tyrians far excel the Hebrews in respect of the hewing of timber. The Temple was, therefore, very much of a timber structure. It would have been surrounded by a plain wall of stone, or the stonework might merely have been the foundation of the enclosure. It was on a small scale, but it was the best that the people of the time could think of, and more than they could accomplish, because they had to go to their neighbours to get it done, and when it was finished it was no doubt very highly esteemed. This was about 1,000 years before Christ. When the Temple was built, Solomon built his own house; and then again he went to Tyre, and engaged men who were skilled in the hewing of wood. They collected trees, and converted them into timber, and carved them, but the carving must have been very rude. The Jews were subsequently carried captive to Babylon, where they remained for many years, but they afterwards returned under the command of Zerubbabel, who was a priest,—not a king,—and then the second Temple was built, 500 B.C. That Temple was not now in question, and he did not know that they really understood so much about it as they might do, except that it was merely a sort of reproduction of the old one, but with different dimensions. That Temple was destroyed by the Romans, and a third temple was built called Herod's Temple. That Temple was a piece of Roman architecture, there was no doubt. With regard to Solomon's Temple, one of the drawings on the wall made it a Greek temple, while another drawing gave it as Egyptian. He contended that it was neither the one nor the other. He advised his hearers, when they came to study any science, that they should dismiss from their minds, imperatively and for ever, everything like wonder or surprise, or astonishment or any such emotion, which was in a degree temporary aberration of mind. They must look at the matter perfectly plainly, frankly, dispassionately, and coolly, or they would never arrive at a scientific conclusion. He would impress upon those present that in dealing with all buildings of remote Asiatic history, they must remember that they were dealing with courts and not with covered huts. In conclusion, he proposed a hearty vote of thanks to Mr. Robins for his paper.

Mr. Rickman seconded the motion, and said one point that had been brought out was that there was much more of timber construction in the Temple than they had been accustomed to suppose. Those designs showing great masonry columns and magnificent bases of stonework were probably a little beside the mark.

Mr. R. Phené Spiers remarked that there was absolutely nothing remaining of the buildings which those illustrations and restorations were intended to show. The natural tendency in all ages had been to restore buildings to a certain extent in the style with which one was most familiar. It was difficult to imagine how any one could have proposed such restorations for the Temple in question. The style given by Mr. Robins represented a much later style than was supposed to exist in the time of Solomon; he had taken his principal elements from some 500 years B.C. There was no doubt that the first efforts of any nation to make an architecture for themselves must have been of the very simplest and ordinary kind. In his opinion not only workers in wood, but masons were brought from Tyre to construct the Temple, the latter of whom made the substructure. At any rate, the architecture of the Temple was of the slightest possible kind, and it must have been in wood covered in metal plates.

Mr. Stannus expressed the interest which all must feel in anything which tended to throw light on the topography, plan, or style of the Jewish temples. Some years ago he had the honour of drawing the plan of Herod's Temple for Mr. Fergusson, for the fine book to which Mr. Robins had referred, and he had then gone through all available authorities on the subject. By taking these three groups, (*a*) the Bible and the "Wars" for the historical incidents, (*b*) the Middoth and the "antiquities" for the plan, and (*c*) the existing site for the topographical facts, he believed it was possible to arrive at a very probable restoration for Herod's Temple. Then we might work backwards, through Zerubbabel's, to the one under discussion,—Solomon's. Mr. Stannus went through the arguments showing that Herod's Temple enclosure was a square of 600 ft. at the south-west angle of the Haram, and that the "Mosque of Omar" could not have been included in it. Further, he supported Mr. Fergusson's theory that this mosque is the Church of the Holy Sepulchre, erected by Constantine over the burial-place of the Lord; and in reference to the change of its locality from the Haram area to the site of the Church of the Holy Sepulchre, in the town of Jerusalem (for the benefit of pilgrims after the Haram was closed against Christians), he reminded the members of the Association how in Verona the demand of visitors for the tomb of Juliet had created the supply. Another instance of possibility of change was that of the American, who wished that the birthplace of Shakspeare might be "moved up nearer to the *me*-tropolis." Having once settled the position of the altar and the Temple walls in Herod's time,—which he thought could be established within very small limits of variation,—he contended that, since these points were identical in the successive rebuildings, it was easy, by working from the central axial line, to plot out the position of Solomon's Temple on the site. As regards the style, while agreeing with Professor Kerr that too much advance in architectural refinement was not to be expected from a people recently emerged from a migratory life, he thought it was clear that the outer walls were of hewn stone, and not merely of wood, as suggested by the learned Professor. From the sixth chapter of Kings we learn the house was built of stone, and wainscoted with cedar panelling, so that no stone was visible inside. The wood was easily carved, and would lend itself to the Assyrian style of decoration, and the lavish use of gold is also more Assyrian than Egyptian. The Phœnicians, who were the carriers for the world, acted as the connecting links. And the Hebrew nation was really of the same family as the Arabs, Chaldees, Phœnicians, and Assyrians, as is seen by analogies of language; hence there was more sympathy and more likelihood to be similarity of style between Jews and Assyrians than with Egyptians. He concluded by thanking Mr. Robins for his exhaustive treatment of the subject, and the very complete collection of illustrative diagrams, and he expressed his regret, in which he was certain all would share, that the serious illness of Mr. Fergusson was likely to prevent his taking any interest in what had been said that evening.

The vote of thanks was then agreed to, and Mr. Robins briefly replied.

ARCHITECTURAL ETHNOGRAPHY.

THE following is a summary of Mr. J. Spencer Hodgson's paper on this subject, read before the Manchester Architectural Association on the 5th inst., as briefly mentioned in our last:—

Ethnology, while constituting a complete and most interesting study of itself, is, as applied to Architecture, the means of bringing before us what effect the religious, political, and social influences had upon the development and typical characteristics of architecture by the earlier races of mankind. As the object of introducing this subject is not to write an essay on ethnology, but to render the history of architecture interesting and intelligible, it will be desirable to avoid all speculation as to the origin of mankind. All that is necessary will be to point out the typical features of the four great building races,—the Turanian, the Semitic, the Celtic, and the Aryan. Prehistoric man has been divided and arranged into three great groups or periods. The first was called the Stone age, from the rude race who then peopled Europe having no knowledge of the use of metals. All the cutting parts of their implements were formed of flint or hard stones. The second, the age of Bronze, from the people having a knowledge of the use of copper and tin, from a compound of which their weapons and tools were formed. The third, the Iron age, from the people having a knowledge of the use and properties of this metal. The typical Turanians in the old world were the Egyptians,—in the modern, the Chinese and Japanese; and to these we are, perhaps, justified in adding the Mexicans. No Turanian race ever rose to the idea of a God external to the world; their government was a despotism. This race never distinguished itself in literature. As architects they were unsurpassed, and in Egypt alone have left monuments which are still the world's wonder. From the fact of their gods having been kings, and after death still only considered as influencing the destiny of mankind, their temples were exaggerated palaces. Even more sacred, however, than their temples were their tombs. They possessed an extraordinary passion for coloured decoration, and an instinctive knowledge of the harmony of colour. In sculpture they were not so fortunate; it was not sufficient that a god should be colossal, he must also be symbolical; he must have more arms and legs, or more heads, than common men; he must have wings and attributes of power. In science they most distinguished themselves in engineering, their artificial irrigation works being remarkable. The Semitic races principally developed themselves in the small tract of country between the Tigris, the Mediterranean, and the Red Sea. The great distinguishing tenet of this race, when pure, is and always seems to have been in the unity of God, and his not having been born of man. Their government was never quite republican; when in small nuclei it was what is generally called Patriarchal. In larger aggregations the difficulty of selection made the chiefship more generally hereditary. Possessing a complete alphabet their literature was far in advance of the Turanians. No Semitic race ever erected a building worthy of the name; neither at Jerusalem nor at Tyre or Sidon, nor at Carthage, is there a vestige of Semitic architecture. When Solomon proposed to build a temple at Jerusalem, though plain externally, and hardly so big as an ordinary parish church, he was forced to have recourse to some Turanian people to do it for him, and by a display of gold, silver, and brass ornaments to make up for the architectural forms he knew not how to apply. Painting and sculpture were absolutely forbidden to the Jews, because they were Turanian arts, and their practice might lead the people to idolatry. Music alone was the one æsthetic art of this race. The Semitic races seem always to have been of too poetical a temperament to excel in mathematics or the mechanical sciences. The Celtic race seem to have crossed the Bosphorus, and following the valley of the Danube, threw off a branch into Italy, where they penetrated as far south as Rome, while the main body settled and occupied Gaul and Belgium, whence they peopled Britain. No Celtic race ever rose to the perfect conception of the unity of the Godhead. Despotism was generally their form of government. Their theology required temples almost as grand as the Egyptians, and without their intervention we should not have possessed in modern times a church worthy of admiration. In the art of wedding music to verse this race is only equalled by the Semitic. The Aryan race seem to have settled themselves in the country between the Indus and the Jumna, about 3100 B.C. The principal branch migrated westward, and first appeared prominently in Greece, next in Rome, and lastly in Northern Europe. They seem to have believed in the one great ineffable God. From their possessing a complete alphabet their literature was more advanced than that of the earlier races. They excelled in the useful rather than the artistic arts. In persuing this subject we find the one grand and fundamental principle that guided the earlier races to such a high state of perfection in the architectural art was based upon the golden rule, "Truth," which is such a marked contrast to the present age of shams.

MESSRS. STEVEN BROS. & CO.'S NEW PREMISES.

MESSRS. STEVEN BROS. & Co., the well-known architectural ironfounders, have recently acquired new and very extensive premises at No. 4, Upper Thames-street, immediately opposite the *Times* Office. Here, under the direction of their manager, Mr. Ritchie, they have fitted up convenient offices and a number of very large show-rooms, the fittings having been carried out from the designs of Mr. James Weir, architect. The premises extend from Thames-street to the river front, and are provided with lifts worked by hydraulic power supplied from the mains of the Hydraulic Power Company. The passenger-lift is by Messrs. Waygood & Co. The ground-floor and basement are mainly appropriated for warehousing and packing purposes, and contain a very comprehensive and varied stock of rain-water and hot-water fittings, ranges, stable fittings, and other goods of the kind. The first floor contains a large stock of railings, balconies, balusters, &c., in all possible sizes, shapes, and varieties of design. On the second floor is a showroom of large dimensions, where register and other fireplaces are shown fitted with chimneypieces of all styles of design and in all materials,—in marble, stone, wood, and iron, and ranging in price from a few shillings to hundreds of guineas. To the rear of this, on the same floor, is a showroom for goods of a cheaper class, the arrangement here being a series of bays, whereby access to the numerous patterns is easily obtained. On the third floor is an extensive display of kitcheners, cooking-ranges, and other domestic appliances,—several ranges 9 ft. and 12 ft. wide being on view. Behind is a showroom for constructional ironwork, railings, gates, staircases, verandahs, stable fittings, and numerous specimens of ornamental ironwork. Smaller rooms above the showrooms contain brasswork, tiles, and sundries, each department being arranged in the way most suitable to the requirements of the business. To prevent the noise which inevitably accompanies the delivery of goods from affecting the work of the counting-house, a small portion has been separated from the general office, and is styled a "forwarding office." Every part of the premises has been utilised, even to the basement, where excellent arrangements prevail for the storage of cast-iron baths and fittings and other goods, down to tiny elbows and bends in the rain-water goods department. The establishment forms, indeed, an exhibition on no mean scale, and one which will be found well worth visiting by architects, builders, and owners of house property who may be in search of iron goods.

EMPLOYERS' LIABILITY.

HAINES *v.* CRACE.

THIS case was tried recently in the Marylebone County Court, and is of some importance to builders and others whose work involves the use of such "movable scaffold," as is ordinarily used in house-painting, namely, "steps," boards, and trestles, which are moved or re-arranged at brief intervals as the work progresses.

The plaintiff, Haines, a journeyman painter, brought an action for a claim of 100*l.* against Mr. John Crace, the decorator, of Wigmore-street, under the following circumstances. Haines was at work with other painters in the kitchen of a club, and engaged on preparatory work, when the trestles which supported the board on which he stood, slipped off the top of an oven on which they had been planted, and which proved to be greasy. It was shown in evidence that the plaintiff, another painter, and a labourer had between them arranged the trestles and boards. But the plaintiff contended that it was the duty of the foreman of the job to have seen the risk, and to have had the scaffold altered. He also contended that, although he himself had a hand in the erection, the labourer was responsible, and was the foreman's delegate in the matter. The plaintiff further endeavoured to convince the jury that painters were not expected to move their trestles, but that this was the labourer's duty.

Mr. Crace, as defendant, showed by his own evidence, and by that of independent witnesses, as well as that of foremen and painters in his employ, that whereas "fixed scaffolding" of poles, &c., is erected by labourers or "scaffolders," the painters themselves do, as a matter of course, shift their own trestles, &c., with or without labourers, and that a painters' labourer's duty is to wait on and assist, as they may require, the gang of painters to which he may be attached; that, as a matter of fact, painters more often work without labourers than with them if there be no fixed scaffold.

The defendant and witnesses also showed that it was frequently necessary to shift trestles several times in an hour or two, and that no work could progress in a large building if the foreman had to approve each removal of trestles in every room.

The judge, in summing up, put three questions to the jury (stating that it could only be through the foreman that liability could have been incurred):—

1. Was it the foreman's duty to superintend the placing of the trestles?

2. Ought the foreman to have discovered that the trestles were not properly placed?

3. Did the foreman exhibit negligence in the matter?

The jury answered all three questions in the negative. Verdict for the defendant (Mr. Crace).

The plaintiff subsequently moved for a new trial, but the application was refused.

STREET IMPROVEMENT CASES.

A CASE of some interest to owners of property came before the Brentford County Court on Friday last, as showing the extent and nature of the liabilities of owners for the payment of the cost of private street improvements incurred by a Local Board.

The Chiswick Local Board sued an owner, Mr. J. H. Hall, for the recovery of 29*l.* odd of the apportioned costs in the making-up of Armadale-road, Chiswick, under the 150th section of the Public Health Act, 1875. The defendant resisted payment on the ground that the Board had actually invited tenders and contracted for the work before the expiry of the statutory notice calling upon the owner to make up the road.

His honour, Deputy-Judge Cooper Wylde, held that no matter what preparations or facilities the Board made before the expiry of the notice for the carrying out of the work, they did not deprive the owner of the right to do the work himself before the notice had expired.

The defendant pleaded further that a previous surveyor had led him to understand that since tenders had been invited there was no use in his making up the road.

Mr. Finnis, the solicitor to the Local Board, disputed this, and asserted that, as a matter of fact, the work was not commenced until six weeks after the expiry of the notice.

His honour gave verdict for the Local Board for the full claim, together with interest and costs.

The Board also sued the same defendant for 13*l.* in respect of private improvements in Swanscombe-road, Chiswick, in which the old question as to the flank wall was raised.

The defendant contended that an allowance should be made to him in respect to the improvements at a flank wall, asserting at the same time that the costs in such cases should be apportioned among the whole of the owners in the street.

His Honour said that that question had been decided over and over again. The 150th section of the Act was clear enough on the point that a flank wall is held as a frontage in regard to the payment of private street improvements.

"PLUMBERS AND PARLIAMENT."

SIR,—With reference to the letter of your correspondent "C. A. M. B." in your issue of the 2nd inst. [p. 63], will you grant me space to inform him that the action of this company is solely directed to securing, as far as may be practicable, greater efficiency in the character of the work done by plumbers in general, and in no sense do the company aim at hedging the trade round with restrictions, as he suggests.

The course which the company have taken throughout has been based upon the resolutions of the late Congress of Metropolitan and Provincial Plumbers, as it has been governed as much by consideration for the journeymen as for the masters, who are heartily invited in a common desire to check the execution of improper or "scamped" work, as it is called

in the common interests of honest tradesmen and the public.

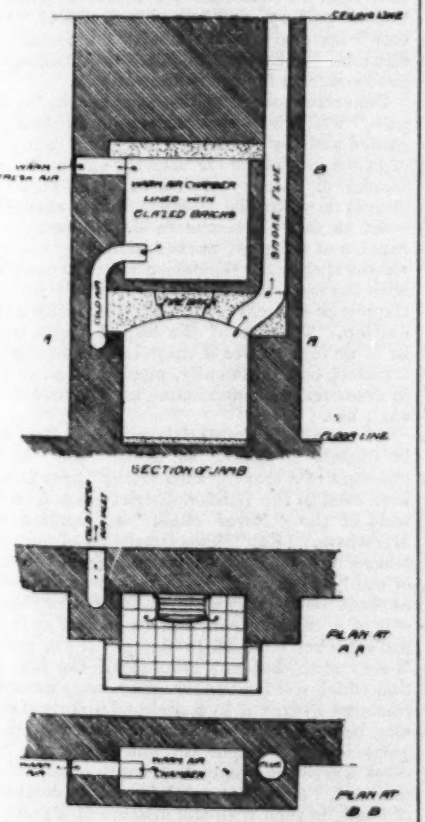
I should add that the company have throughout sought for, and, to a considerable extent, they have secured the cordial sympathy and active co-operation not only of builders, but of architects and others immediately concerned in house-building, who fully recognise the object we have in view is one of vital importance to the health of the community.

I may further add that I have no knowledge of the communication from the Builders' Association being received as mentioned by your correspondent, but I can assure him that we should be very glad to see that Association represented on the General Council, for in no sense do we desire to pursue a policy of exclusiveness, but on the contrary, we court the opinions and desire the co-operation of all who are prepared to take a broad view of the subject, and join their efforts with ours to work out a reform which is admitted on all hands to be one of national importance.

GEORGE SHAW,
Master of the Worshipful Company of Plumbers.

VENTILATION.

SIR,—The question of ventilating rooms with fresh warmed air has very often of recent years been brought before the public, but I do not think the system shown in the diagram I enclose has been illustrated.



Your readers will notice the arrangement is very simple: the heat, instead of passing up the chimney, impinges on the fire-bricks, and thus the air in the chamber above, which is lined with glazed surface, is warmed, and the outlet for this warmed air into the room is also shown. In summer the air unwarmed could be admitted through the same openings.

I have pleasure, therefore, in sending you this diagram, which, I may mention, has been adopted with success in a few instances. It may interest your readers, and I send it as a suggestion to be improved upon.

BANISTER FLETCHER.

Weymouth.—A colossal marble statue was unveiled on Wednesday, the 13th inst., at Weymouth, by Mr. R. N. Howard, the Mayor, in honour of Sir Henry Edwards, one of the representatives of Weymouth in the House of Commons from 1866 to 1885, when the town ceased to be a Parliamentary Borough. The sculptors are Messrs. W. & T. Wills, of London, and the cost of the work is 800 guineas.

TIMBER MEASUREMENT.

SIR,—In my letter inserted in your last impression [p. 107] I made no comment on the *facts* of Mr. Wardale,—his supposed discovery being a matter of common knowledge among English timber merchants and measurers,—but merely answered his inquiry as to the *principle* on which I presumed the tables and scale to which he alluded were based. Your editorial note, however, induces me to trespass a little more on your space than I then thought necessary.

In the days when sheriffs of the City of London were seriously required to count hobnails and verify tallies as a crowning test of arithmetical attainments, it can hardly be wondered at that the rustic "hewers of wood and drawers of water" should fail to perceive what you designate them as blockheads for not perceiving, or that their erroneous but convenient method of measuring round timber, or logs, should have grown into a general custom, which there was not sufficient inducement for the more enlightened dealers in timber of the present century to depart from.

George Cruikshank's fox was misled by a name when he robbed the tailor's workshop instead of the farmyard; but your correspondent can hardly believe that the astute land agents and timber merchants of the last eighty years have been unconsciously fleeced all that time, to the tune of 20 per cent., by a deceptive measure.

Neither the grower nor the first purchaser is deceived, and therefore not injured; and after "conversion" of the stuff by the merchant, the string's occupation is gone.

The grower sells by string measure; the merchant estimates and purchases by the same, and, if he sells in the log, sells by the same; so that I fear that the last paragraph in Mr. Wardale's second letter will have no more effect on the trade than will, in time, the information which I now impart (in strict confidence), viz., that that last hamper of '47 which he had from Messrs. Binn & Sellarman, invoiced as in quarts and pints, is quite 25 per cent. short of the nominal quantities,—but may he enjoy it none the less!

A word for poor Hoppus. I am not concerned in the *discordia fratrum* between him and Mr. Keay; but may I ask of what use would have been a set of tables based on a principle, however correct, which had never obtained since timber became a marketable commodity? He found a "practical" custom in use throughout the land, and framed his tables in accordance therewith.

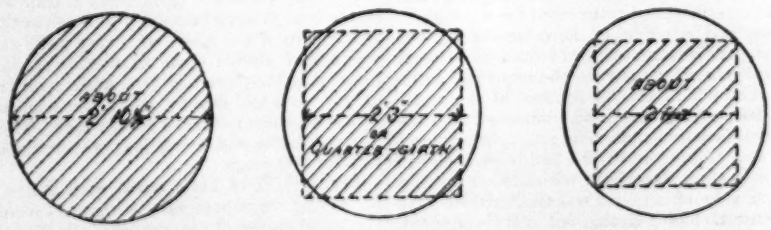
GODALMING.

SIR,—The general practice in measuring round timber twenty years ago, when I had some experience in the Berkshire woods, was precisely as described by your correspondent "Godalming," and in accordance with the rule given by Hoppus, viz., to gird the tree, and double the line twice for the quarter girth, which may be designated B.

If we take the instance given by Mr. Wardale, of a trunk 15 ft. long and 9 ft. in girth, the above method will be found to supply a happy medium between the other methods mentioned by him. The first of these, which we will call A, "considering it a cylinder, the cubical content of which is 96 ft.," though strictly correct, gives far too much for practical purposes, as, when the tree is cut up into planks or scantling, there must be very considerable waste.

The other method, which may be called C, viz., reckoning only the exact square contained in the circle, giving 61½ ft. cube, errs in the opposite direction; this amount is too little, as the four outsides or segments are wrongly treated as if they were wholly useless.

The following diagram illustrates the three methods, and proves that the middle one, B, yields



a fair result, viz., 75 ft. 11 in. cube; as the small segments make up for the trifling loss at the four corners of the square. When converted into planks or scantling and measured up as such, the net result would prove to be in almost exact accordance therewith.

HENRY STAINES.

*** The question brought forward in the previous correspondence was to ascertain actual cubical contents of the trunk. This, and the question of ascertaining roughly the amount of workable timber, have been rather confounded together by the various correspondents.—ED.

THE CLAPHAM STATUES.

SIR,—I have received the inclosed letter relative to the discovery at Clapham with permission to publish same. I shall feel obliged if you will insert it in your valuable paper.

THOMAS MILBOURN,
Hon. Sec. Surrey Archæological Society.

"3, Bank Buildings, E.C.
Jan. 8th, 1886.

Sir,—Much of late in the various papers of the day, in reference to the discovery of monuments at Clapham. I, when a boy, resided there, and about fifty years back, a large boiler was being taken into the chapel, to warm it. On passing over this said vault, the entrance broke in, and I, with two or three other boys, got a wax taper at night, and got into the vault, which was full of coffins, besides the statues, which broke in on touching them. A week or two after, a mason in Manor-street cleaned the sculpture, and it was lighted up with candles, and some hundreds visited the vault; so that your friends there must not think themselves Belzoni or Layard, for I think I was the one; and if our friends look close to the young lady's face, they may find some plaster of Paris there still, for we tried to take a cast, but failed. In Cooke's 'Surrey,' you will find an account of the said marbles.—I am, sir, yours respectfully,

T. BROWNE."

THE EXAMINATION IN ARCHITECTURE.

SIR,—It has been announced that the next Examination in London to qualify for candidature as Associate of the Institute, will be held at No. 9, Conduit-street, on March 22nd, and the following days of that week.

Notwithstanding the wide circulation which, through the medium of the Architectural Association and provincial societies, has been given to the pamphlet containing the programme of the examination, advice to candidates, and list of books (which pamphlet can be obtained by any student on application to the Secretary of the Institute, and has been printed in full in the kalendar issued at the commencement of the session to every member), I hear occasionally that some intending candidates are desirous of obtaining further information for guidance in their studies.

Being most desirous to assist in advancing this examination,—on the success of which much of the future prosperity of the profession and the Institute depends,—I shall be happy to receive here, by *previous appointment only, fixed by me*, any gentleman who actually intends to offer himself for examination, either in March or at a subsequent period, and to answer his reasonable inquiries, and to give him such advice as my experience as Chairman of the Board of Examiners may enable me to afford.

I earnestly hope that those students who have hesitated to come forward, from any doubt as to the nature of the Examination, will not fail to seek a conference with me.

ARTHUR CATES.

No. 7, Whitehall-yard, Jan. 13, 1886.

PROVINCIAL NEWS.

Barrow-in-Furness.—The high-level bridge which is being constructed by the Furness Railway Company and the Corporation of Barrow-in-Furness to give better communication between the town of Barrow and the extensive docks and ship-building and other works on Barrow Island is rapidly approaching completion. The corporation portion of the bridge extends from Duke-street to the south side of Hindpool-road, and has necessitated the purchase and removal of much old property, and as this was also some of the worst in the town its removal is by no means to be regretted. The bridge, with its approaches, extends from Duke-street to Michaelson-road, the total length being about 500 yards. The corporation portion of the work consists of an approach 80 ft. wide and 184 yards in length, and a skew wrought-iron bridge, 60 ft. in width and of 50 ft. span, over Hindpool-road. A considerable length of the roadway of the approach is carried on segmental brick arches of 24 ft. span, built in

Portland cement mortar to a gauge of one of cement to three of clean sharp sand. The iron bridge has six main wrought-iron plate girders, each 3 ft. 4 in. deep, with cross girders and wrought-iron floor-plates, covered with cement concrete, on which will be laid the wood pavement to form the roadway. The footways are partly carried on brackets springing from the two outside girders. The parapet plates are of cast-iron, on which are cast geometrical patterns, standards being fixed at every 4 ft. 6 in. to receive the plates and divide the parapet into panels. On the centre panels of the parapets are cast the armorial bearings of Mr. John Fell, the Mayor of the Borough at the time the work was commenced. Under each main girder where it rests on the abutments are brackets, those under the outside girders, however, being much larger and of a more striking appearance than are the intermediate ones. The four large brackets have the borough arms cast on them. The general design of the bridge over Hindpool-road has been carefully got out to harmonise as far as possible with the railway company's work designed by Mr. F. Stileman, C.E. The abutments on each side of Hindpool-road are built of white limestone from Stainton Quarry in the immediate neighbourhood, and have been boldly treated, the whole presenting a very substantial and effective appearance. The abutment on the south side has two openings, one giving access to the subway leading to the town wharf, the other to the railway and arches at the back. The abutment on the north side has an opening which forms an entrance from Hindpool-road to the brick arches and interior of the abutment; these it is intended to utilise as stores, for which purpose they are admirably adapted. The corporation approach and bridge have been designed and carried out under the direction of Mr. Fox, Assoc. Mem. Inst., C.E., the Borough Engineer. Mr. John Fell, of Leamington, is the contractor, and has, under the constant and careful supervision of Mr. Cutler, Student I.C.E., assisted by Inspector Shaw on the ironwork, carried out the works in a satisfactory manner. It should be mentioned that the whole of the ironwork was manufactured and erected for Mr. Fell by Messrs. Westray & Copeland, of Barrow.

Lynmouth.—At a meeting of the Lynton Local Board of Health, on December 28th, the Board decided to instruct Messrs. Davison & Davison, civil engineers, of Windsor, to prepare the necessary plans and details for the construction of an esplanade at Lynmouth, and also certain works with a view to provide a convenient bathing-place.

Oldham. — Buildings for the use of the Salvation Army in Oldham are about to be erected in Union-street. The accommodation comprises a large main hall to seat 3,000 persons, and which is approached from the street by a short flight of stone steps on to a corridor which runs at right angles, right and left to two staircases, one on either side. Access is also gained from here to the main floor, constructed with a good fall to the speaker's platform. The staircases are the main public exits from a deep gallery extending round the entire length, thereby intersecting the speaker's platform, which is stepped up from the floor-line. As the site is at the corner of two streets no difficulty has been experienced in providing light and air. By the side of the large hall is a smaller one, intended to be used for week-night services, and capable of accommodating 800 persons. This is approached from Union-street by a wide corridor between the main hall and a large shop which stands in front of the small hall. Behind this hall and connected with the main hall is a large catering room, bandsmen's room, &c. The front of the buildings is of red brick with stone dressings, with a tower running up each side of the main hall, finished with battlements. Tudor-Gothic is the style adopted. The entire block covers an area of 12,250 square feet, and the estimated cost is 4,500*l.* Mr. E. J. Sherwood, of London, is the architect, and the work will be carried out under his superintendence.

Dawlish.—The Local Board of Dawlish have decided to obtain the opinion of Mr. James Lemon, C.E., of Westminster and Southampton, as to the best means of disposing of the sewage of the district.

Basingstoke School Board.—We are asked to state that the assessor in this competition was Mr. F. W. Roper, of Adam-street, Adelphi,—not of John-street, as stated last week.

The Student's Column.

FOUNDATIONS.—III.

ARTIFICIAL FOUNDATIONS.

THE means at the command of the architect for providing a good foundation in the unsatisfactory soils, which have already been mentioned, resolve themselves practically into three classes :—

1. Modes of spreading the weight of a wall over a large area, so as to reduce the load on each superficial foot of ground, as by footings, concrete, &c.

2. Modes of sinking or reaching down through a soft soil to a harder subsoil, on which the weight may be carried, as by piling.

3. Such expedients as ramming the surface of the ground or the bottom of a trench to consolidate it; arching or bridging over bad parts of the foundation; and the utilisation of lateral pressure by means of beds of sand or of sand-piles placed under the walls.

Footings, in one form or another, are amongst the most ancient means used for spreading the weight of a wall, as the large feet of the camel distribute its weight so as to enable it to travel without sinking over the surface of dry sand. In the foundations of ancient stone walls the lower courses often spread considerably with rather high steps of slight projection, finishing at the top of the plinth, which satisfies the eye that some such means of obtaining increased stability exist. The cracked and dangerous condition of many of our old brick buildings is due to the omission of any kind of projections beneath their bases,—a deficiency very poorly made up by the use of ties and bond timber to keep the tendency to fracture within limits. In a brick wall the footings are, in modern practice, and, indeed, by such law as exists, made to project by regular off-sets in each course from the base of the wall downward, so that the bottom of the lowest course is in breadth double the thickness of the wall. Where the soil is at all unsatisfactory, the lowest projection of the footings should be made in two courses, so that the lower course may not be broken or tilted in the way that has been mentioned above. Unless care is exercised in the supervision of the work, the worst and smallest pieces of brick are often put in the lowest course of footings, so as to render that course not merely useless, but a means of breaking up the courses above when weight comes on the wall. Materials of the fullest size should be used in footings, so that the joints in the projecting courses should be as far from the outside as possible. Where concrete cannot be used, the spread of the footings may be increased by putting more off-sets and more courses in each of the off-sets, so as to obtain gradually a sufficient breadth of foundation.

The simplest means for spreading the weight of a wall beyond the extent of the footings is to lay pieces of timber, 4 ft. or 5 ft. long, across the line of the intended wall as the sleepers are laid under a line of rails, but so as to be close together. Upon them planking is fixed, which will carry the footings or the base of the wall. This plan is only suitable for buildings of moderate weight or of temporary character, and if the timber is not put below the level of the water in the soil it will rapidly decay. On a boggy site, where the surface soil is thin, it may be the best material that can be made available. In the case of the tower of a very large church which had shown signs of weakness, it was found that the piers had been built upon trunks of oak trees laid side by side upon a subsoil of soft mud, so as to form a sort of raft. This had decayed in the end, but it had been in that position for 500 years.

Large slabs of hard stone, such as are used for paving, have been used with good results in the worst cases of foundations in made ground that was expected to settle considerably and in an irregular manner. But the use of concrete has in recent times superseded all other means of obtaining wide foundations, at least as regards buildings of any great size and importance.

Concrete in general may be looked upon either as an artificial stone or an indurated gravel. It most resembles rocks of the class called "breccias" or "conglomerates," which consist of gravel or fragments of stone reunited into a solid mass. During the last half-century it has been rapidly superseding other materials and contrivances for obtaining secure foundations, and it may be expected that its employment in the walls, floors, stairs, and roofs of buildings will become more extensive as the manipulation of it is better understood. In the Student's Column for January 17th, 1885, p. 119, will be found a description of concrete when it has to be used for the most important objects, and under the best conditions.

We have to deal with it here simply as a means of spreading the weight brought down by a wall or pier over a greater area. So used, it may be assumed that it will be placed on a bad subsoil; for there would be no object in placing it upon a good one. In discussing the comparative merits of different materials, we should not forget that in the great majority of cases the worst of the materials in ordinary use would be so great an improvement upon the natural foundations, that they would probably effect the desired object. It becomes, therefore, an important practical question whether, in any particular foundation, the material most readily available will be of ample strength for its purpose rather than whether it is the best conceivable material for walls or floors or roofs. We shall see that gravel or sand placed in trenches, even without any cementing material, may have an important utility.

The materials generally available for concrete are burned clay (known as burned ballast), gravel, slag from iron furnaces, broken flints, broken stone.

Experiments in crushing concretes made of these materials with cement place them in the above order,—the weakest being the first-named. Upon a town site broken bricks form an important item in materials for concrete; clinkers, broken pottery, and any description of "hard core" are also useful when they are easily obtainable. Let us see what are the qualities of a good concrete for use in foundations.

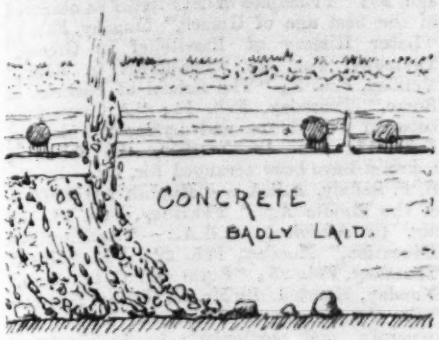
Concrete consists of two things,—the "aggregate," which is of such materials as those just named and the cementing medium. The point of prime importance is that the aggregate shall consist of pieces varying in sizes, from the largest down to the smallest, which should be, —let us say,—a coarse sand. These must be capable of being so packed that they leave no vacant spaces the cementing material combined with the sand filling up all intervals between the pieces and covering each piece with a thin coating. The size of the largest pieces would be of no importance if they could be evenly distributed, but, practically, pieces of 2 in. or 3 in. in diameter, as a maximum, are the best, as we shall see.

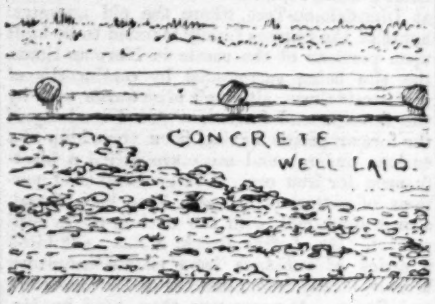
The cementing materials may be a lime that is slightly hydraulic so as to "set" in the moisture of a trench, such as the "grey stone" lime used in the London district made from the beds of the "lower chalk" at Dorking and Merstham. "Fat" limes consisting of pure carbonate of lime, such as is made from the beds of the "upper chalk," and is known in London as chalk lime,—very white and useful for plaster, —is of no use for concrete or mortar as it will not set when exposed to damp. If the ground is very wet,—but not otherwise,—the blue lias lime which sets best under water, being naturally rendered hydraulic by a slight admixture of clay, may be used with advantage. In cases where quick-setting is important, and in the very rare cases where the greatest strength obtainable is required, Portland cement (which is composed of chalk burned with the mixture of a due proportion of alluvial clay) is the best material that can be employed.

The proportion of cementing material specified is usually one part to six of the aggregate. It is highly improbable that such a strength is kept up in practice, unless where the ingredients are carefully measured, which they should be in all cases of importance. If one part in eight is specified and used, that will probably be found sufficient for all ordinary cases,—and with lime, —but cement, besides being more costly, is more easily "killed" by admixture with dust or dirt, and if it is deemed necessary to use it the stipulated proportion according to the cleanness of the aggregate should be kept to with accuracy.

The mixing is generally done on a temporary planked floor. For accuracy, it is best to have a bottomless frame or box, 3 ft. square and 18 in. high, holding half a yard of aggregate. When this is filled level to the rim, a similar box, containing, say, one-sixth of that quantity may be placed on the top of the aggregate and filled with the cementing material. On lifting first the small box and then the large one, the whole will lie in a heap ready for mixing.

Having been well turned over dry, water should be added regularly and in moderate quantity, without drenching, so that the whole will form a semi-fluid mass when it has been again turned over and placed in the barrow. If, now, this is dropped into the trench from a height no





greater than such as will make it flow by its own weight so as to fill up every part of the trench, without being trimmed or regulated by hand, it will be packed as well as the nature of the particular aggregate can admit of. The filling in must be done regularly, so as not to raise the level of the concrete more than about 18 in. in any one course, following on afterwards with other courses till the required depth is obtained. If the full depth should be much more than 18 in., and the concrete should be thrown in so as to fill it up at once, advancing along the trench with a steep fall at the place where each load is deposited, the larger pieces will roll down the slope, causing an irregular composition, the poorest quality being at the top. If the concrete is thrown down from a considerable height, the larger pieces will sink down and separate from the smaller pieces. All pieces of sizes greatly exceeding the ordinary pieces are likely to separate themselves in this way. Round, smooth pieces, as in gravel, will separate themselves (under such conditions) more easily than angular pieces.

But gravel is the material which, when put in the trench in a proper manner, will flow most easily and become packed so as gradually to fill every part of it without further manipulation, and the stones will so arrange themselves that no places are left void. It is, besides, of ample strength for all ordinary purposes, and is, therefore, the most eligible material for use. To judge by inspection of the heap whether the gravel is suitable, it is necessary to see that there is a large proportion of stones of the full size, a considerable admixture of smaller gravel, and plenty of sand, so that the aggregate shall lie in the mass without hollow spaces. When the proportion of cementing material is added it will be sufficient to fill up the spaces between the grains of sand that are packed between the pieces of gravel so as to make a coarse mortar, and the larger pieces will be completely surrounded with a composition that will more or less quickly become hard and firm. The adhesion between the cementing material and the gravel will be slight as compared with the case of broken stones where the rough surfaces unite closely with the lime or cement; but in a trench, and subject only to the dead pressure of a wall, this matter is of less importance. If the sand is too abundant in the heap it is easy to sift out a portion for use in mortar. If the larger stones are too few the deficiency may be supplied by broken bricks. Every part of the long process by which gravel has been formed in the river or along the shore has tended to make it flow and pack more closely, a point which is greatly in favour of a material which is, besides, so easily available.

Burned ballast varies very greatly in quality. When hard, with a good proportion of large pieces, and free from much dust, it makes a very good, firm concrete. It should be well wetted in the heap before mixing, because of its porous nature and dryness. Broken bricks, broken stone, and other materials not naturally mixed with sand, require to have a sufficient proportion of coarse sand and gravel added to them to fill up the voids in the aggregate. It is quite possible to fix the proportions in which such mixtures should be made in order to produce good concrete; but this can only be done by making experiments with each kind of material, and, indeed, with each sample, that it may be proposed to use. It is constantly needful to judge, and at once to decide whether the composition of concrete is such as to be satisfactory. This can only be done with confidence after a sufficient experience gained by watching the mixture of different materials, seeing that they are properly placed in the trench, and, when possible, inspecting the same concrete after it has had ample time to become set.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

3,814, Drain Traps. W. H. Tylor.

To carry up the ventilating openings of traps to the surface of the ground, several forms of extension pieces are to be employed, combined together as may be found necessary. In separating traps, a partition rises slightly above the outlet, which outside the trap turns upwards in order to retain a proper level of liquid in the trap. The inlet turns downwards into the liquid, and may be flattened at the end; in front of it is an angle-plate for separating the fat. The trap is provided with a removable cover, and the outlet with a hand hole.

11,247, Excavating Grab. H. J. Coles.

The bucket segments are of the ordinary construction. Their frame is continued upwards in the form of a trunk on which slides the cross-head, and down which the lifting-chains pass. Catches are provided that lock the crosshead to the trunk, when the grab is at rest. These catches have weighted tail-pieces to cause them to fall into slots prepared in the trunk to receive them. Suspended from the crane jib is a frame with hanging hooks. These are arranged to hold the flange of the crosshead, so that when the chains are slackened the trunk sinks, and opens the grab. At the moment that the catches fall into their slots, a tapered head on the trunk bears against inclines on the hanging-hooks, and disconnects them. The grab can then be lowered open. When the buckets reach the ground, the rods press upwards by means of lugs against the tail-pieces, and so release the catches; the segments then close, and the operation is repeated. Two lifting-chains are used attached to the frame of the bucket. They pass round sheaves on the frame, and so up the trunk to the jib.

13,422, Imitating Stained Glass. A. M. F. Caspar.

A suitable design is copied on the surface of a glass sheet of any kind by attaching to it variously shaped cardboard strips coated to imitate gold or lead, &c., with a strong adhesive, which may be white-lead coloured to match the strips. To imitate the solder employed with the lead strips for stained glass, bronze powder is mixed with spirit-varnish (such as copal dissolved in alcohol) dropped on the cracks and brushed slightly over while damp with light bronze powder. After drying the colours are floated or painted on the reverse side of the sheet to the cardboard strips, any superfluous colour being removed by draining, or by a rag dipped in methylated spirits, a coating of mastic varnish and cardboard strips corresponding to those upon the reverse side may be applied over the colours. Some parts of the sheet may be ground to resemble frosted glass by the use of damp sand and a glass muller.

NEW APPLICATIONS FOR PATENTS.

Jan. 1.—15, M. Golightly, Turn Button or Fastener for Securing Doors, Window-sashes, and Casements.—19, W. Carr, Apparatus for Preventing Concussion in Water Pipes, &c.—30, E. Jones, Combination Shovel, Riddle, and Sieve.—31, W. Joy, Utilisation of Waste Heat from Cement and Lime Kilns.

Jan. 2.—54, W. Hilder, Lowering and Raising the Upper Halves of Sliding Window Sashes, &c.—69, R. Stevens, Improvement in Dry Glazing.—76, C. Wells, Improved Decorative Material for Walls and Floors.—78, C. Watkins, Improvements in Graining Tools.

Jan. 5.—142, J. Brown, Cross Ventilation of Sewers.—146, J. Ferguson, Improved Material for Fireproofing Internal Surfaces of Buildings.—153, O. Elphick, Apparatus for Discharging Water from Flushing Cisterns.—157, J. Bennison, Apparatus for Curing Smoky Chimneys and Preventing Down Draught.—175, H. Haddan, Improvements in Ventilators, Chimney, and Smoke Stack Cowls.—179, R. Evered, Connecting Door Knobs to the Roses of same.—189, J. Mackenzie, Improved Method of Securing Metal Sash Bars in Roofs and Other Structures.—201, R. Hellyer, Sewer and Impure Air Burning Apparatus.

Jan. 6.—210, J. Hargreaves, Improvements in Gullies.—215, C. Homer, Improvements in Window Sash Fasteners.—228, G. Hardingham, Improvements in the Construction of Lattice Bridges.—229, J. Hendra and W. Gooding, Improved Construction of Treads of Stairs, Door Steps, Landings, Floors, &c.—235, J. Frazer, Self-adjusting Apparatus for Cleaning Windows.—247, R. Bowman, Improved Water-waste Preventer.

Jan. 7.—255, W. Gallon, Improved Mode of Constructing Stone or Concrete Piers or Breakwaters.—269, J. Barry, Improvements in Pipe Tongs, Wrenches, or Spanners.—274, S. Jackson, Improved Traps or Syphons for Urinals, Wash-basins, Sinks, &c.

PROVISIONAL SPECIFICATIONS ACCEPTED.

14,151, A. & J. Childs, Raising and Lowering Window-sashes and Shutters.—14,707, M. Chaboche, Improved Stove or Fireplace.—14,866, R. Somers, Improvements in Fireplaces.—14,874, R. Best, Improvements in Central Light Gaseliers.—15,185, T. Carder, Improvements in Kilns.—15,195, E. Coldwell, Apparatus for Burning off Old Paint.—15,298, J. Baldwin, Improvements in Door and other Bolts.—14,042, W. Hulse, Improvements in Planing Machines.—14,313, R. Gregory and H. Harris, Ventilation.—14,484, A. Noble, Improvements in Ventilating and Chimney Cowls.—15,032, J. Armstrong, Improved Laths for Revolving Shutters.—15,233, E. Emanuel, Self-closing Ball Valve.—15,235, W. Macrone, Apparatus for Checking the Time of Arrival of *Employés*.—15,248, O. Elphick, Improvements in the Joints of Stoneware Pipes.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to opposition for two months.

2,247, J. Horne and S. Hollyman, Improved Construction of Chimney-pots to Prevent Down-draught.—14,731, S. and W. Pickering and J. Norton, Improved Door Check and Spring.—14,851, R. Eidsforth and F. Mudford, Improvements in Lightning Conductors.—14,932, J. Vaughan, Improvements in the Handles of Trowels, Spades, &c.—2,412, J. Tulloch, Improved Sash Window.—2,519, M. Brown, Combined Bedstead and Bath.—3,656, F. Rogers, Improved Vane and Indicator.—14,148, A. Lloyd, Combined Electric Bell and Pendulum Indicator.—14,493, W. Lilley, Improvements in Window and Sash Fasteners.—15,016, W. Berridge, Improvements in Domestic and other Stoves or Fire-places.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

JAN. 5.

By C. & H. WHITE.

Kennington—66 and 68, Henry-street, 23 years, ground-rent 6*l.* 6s.	£430
Old Kent-road—334 to 340 even, Commercial-road, 7 years, ground-rent 11*l.*	150

By W. B. HALLETT.

Midford, near Bath—The lease and plant, &c., of the Midford Fuller's Earth Works	2,600

JAN. 7.

By MESSRS. POWELL.

Bayswater—25, 29, and 31, Gledhow-gardens, unfinished, 87 years, ground-rent 162*l.*	11,290
36, Miniature-square, 28 years, ground-rent 3*l.*	610

By PHILLIPS, LEA, & DAVIES.

East Ham, Essex—Three Plots of Freehold Land	150

The Japanese Village.—Last week Mr. James C. Humphreys, of Albert Gate, appeared to a summons to answer the complaint of the Metropolitan Board of Works that he had infringed a section of the Building Acts by keeping open Humphreys' Hall as a place of public resort and entertainment under the authority of the licence granted by the Magistrates without obtaining the certificate that the building was completed in accordance with the requirements of the Board of Works. Mr. Besley, who appeared for the Board, said that penalties were claimed in respect of three days, December 3rd, 14th, and 23rd, on which dates the public were admitted to Humphreys' Hall, and where entertainments were given. Mr. John Hebb produced the regulations made under the Act of 1878. Mr. Humphreys had not been granted a certificate for Humphreys' Hall. Witness showed that the exits provided were altogether different to those shown on the approved plan. In the opinion of witness they were insufficient. There was considerable danger from fire. He had seen the Japanese smoking in their shops, and in some of the huts there were braziers of live charcoal. The Magistrate fined the defendant 50*l.* in respect of each day stated in the summons,—150*l.* in all. Out of this sum 25*l.* costs was allowed, on Mr. Besley's application.

MEETINGS.

MONDAY, JANUARY 18.

Royal Institute of British Architects.—Business Meeting (for Members only). 8 p.m.

Royal Academy of Arts.—Mr. J. E. Hodgson, R.A., on "Art in England: Reynolds." 8 p.m.

Society of Arts (Cantor Lectures).—Professor H. S. Hele Shaw on "Friction." (I.) 8 p.m.

Liverpool Architectural Society.—Mr. J. M. Hay on "St. John's Site: its Fitness for a Great Cathedral." 7 p.m.

Architectural Section of the Philosophical Society of Glasgow.—Mr. Charles Gow, on the "Combined Decorative Arts of Glass and Colour."

TUESDAY, JANUARY 19.

Institute of Builders.—Second Ordinary General Meeting. 2 p.m.

Institution of Civil Engineers.—(1) Discussion on Mr. F. J. Rowan's paper on "Gas-Producers." (2, time permitting), Mr. C. E. Stromeyer on "The Injurious Effect of a Blue Heat on Steel and Iron." 8 p.m.

Statistical Society.—Dr. Robert Giffen on "The Progress of the Industrial Classes." 7·45 p.m.

Manchester Architectural Association.—Mr. J. Murgatroyd on "Fifteenth and Sixteenth Century Work in the Valley of the Loire." 7·30 p.m.

WEDNESDAY, JANUARY 20.

Society of Arts.—Captain Douglas Galton on "Mechanical Motors for Tramways." 8 p.m.

British Archæological Association.—(1) Mr. H. Syer Cuming on "The Old Traders' Signs in Westminster Hall." (2) "Notes by the Late Rev. D. M. Haigh on Barnack Church," communicated by the Rev. Canon Argles. 8 p.m.

Sanitary Assurance Association.—(*Parkes Museum*).—Professor T. Roger Smith on "A Damp House." 8 p.m. (admission free).

Royal Meteorological Society.—Annual Meeting. The President (Mr. R. H. Scott, F.R.S.) will deliver an Address. 7 p.m.

Builders' Foremen and Clerks of Works' Institution.—Annual Meeting of Members. 8·30 p.m.

THURSDAY, JANUARY 21.

Royal Academy of Arts.—Mr. J. E. Hodgson, R.A., on "Art in England: Gainsborough and Romney." 8 p.m.

Society of Antiquaries.—Mr. W. H. St. John Hope on "Examples of Mediæval Mazers." 8·30 p.m.

Parkes Museum.—Mr. R. F. Grantham on "The Working of the Separate Sewage Systems." 8 p.m.

Society for the Encouragement of the Fine Arts.—*Conversazione* at the Piccadilly Galleries. 8·30 p.m.

London Institution.—Professor John Perry on "The Distribution of Electric Power." 7 p.m.

York Architectural Association.—The Rev. Newton Mant on "Classic Architecture and Modern Church Building." 7·30 p.m.

Edinburgh Architectural Association.—Professor G. Baldwin Brown, B.A., on "Sir Christopher Wren." 8·30 p.m.

FRIDAY, JANUARY 22.

University College.—Professor C. T. Newton, C.B., on "Greek Inscriptions." II. 4 p.m.

Miscellanea.

The Late Dr. Birch.—The anniversary meeting of the sixteenth session of the Society of Biblical Archæology was held on Tuesday night at its rooms in Conduit-street, Prof. C. T. Newton, C.B., D.C.L., one of its vice-presidents, being in the chair. In opening the proceedings of the evening the chairman alluded to the great loss which the society had sustained by the death of Dr. Samuel Birch (President of the Society), whose wide acquirements, profound and varied scholarship, and unconquerable industry had been of the highest possible value to its prosperity and usefulness. For forty-six years, Mr. Newton said, he had known Dr. Birch; and during the greater part of that period had been shoulder to shoulder with him at the British Museum. He hoped the society might be able to find a worthy successor, under whom, and under the influence and memory of Dr. Birch's noble example, it might successfully prosecute and amplify the studies upon which it had entered under his guidance. Canon Beechey, who said the Society of Biblical Archæology was almost exclusively the creation of Dr. Birch, moved that a vote of condolence should be passed to Mrs. Birch on the death of her husband. The motion was passed unanimously. Sir Henry Layard was elected President of the Society.

Assessment Appeals.—We understand that Mr. Penfold, Messrs. Fuller & Fuller, and Messrs. Hedley have been instructed by Messrs. Nye, Greenwood, & Moreton, acting as solicitors on behalf of the Assessment Committee of Fulham Union, the Overseers of St. Saviour's, the Overseers of Christchurch, the Governors and Guardians of St. Mary (Newington), the Governors and Directors of St. Mary Magdalene (Bermondsey), and the Overseers of St. George-the-Martyr, to assess the values of various properties in the parish of St. Mary Abbott's, Kensington, in connexion with the different appeals by the above bodies against the totals of the gross and rateable values of the valuation list of the parish of St. Mary Abbott's, Kensington.

British Archæological Association.—At the meeting of this Association on the 6th inst., the chair was taken by Mr. S. Tucker (Somerset Herald). Reference was made to the congress to be held in the autumn, under the presidency of the Bishop of Durham, the head-quarters to be some town in the diocese. The Rev. Scott Surtees reported some curious discoveries at Dimsdale-on-Tees, where the old ancestral house of the Surtees family is found to be built upon portions of the castle in Norman times, the site being surrounded by earthworks of prehistoric times, although afterwards used by the Romans and Saxons, a paved roadway of the former people having been traced up to a curious underground structure called a blast-furnace for iron ore. A large number of portions of pottery of all ages have been found, also a stone celt, with the cutting-edges still perfect. Mr. Loftus Brock, F.S.A., exhibited a series of rubbings from sixteenth-century brasses, mostly from churches in Hertfordshire and Bucks. A paper was then read by Mr. Romilly Allen, C.E., F.S.A. (Scot.), on the "Sculptures of the Norman Doorway at Alne, Yorkshire." This doorway is on the south side of the church, and it consists of two orders of arched stones neatly sculptured, there being figures of animals on the outer order, having Latin names above them. These have been identified by the lecturer as having been taken from a Mediæval Beastiarius, with spiritual explanations more or less apparent. Thus at Alne we see the fox, who is represented lying as if dead, for the birds to approach him. The fox represents the devil. Calendus is a white bird which can tell whether a sick man will live or die, supposed to be symbolical of Christ. Terobolem are two mystical stones which emit fire, found in the East, supposed to symbolise the love of man and woman, or that of Christ for his Church. At Alne, two figures, a man and woman, are shown surrounded by flames. Aspido, the whale, acts as destructively to a ship as does the fox to the bird; he also represents the devil. A large number of old MSS. were passed in review by the lecturer, and the analogy of representation at Alne shown to be identical. Mr. De Gray Birch, F.S.A., pointed out the resemblance of one of the figures to the Harpy of the Egyptian monuments. The concluding paper was by Mr. J. W. Grover, F.S.A., on the discovery of the Atkins monumental figures in the mortuary-vault beneath the site of the old church at Clapham. After tracing the history of these works, he referred to his discovery of them, and suggested means for their being brought up to the light of day. Letters were read from General Pitt Rivers and others, and Mr. Atkins spoke as to the great amount of local interest taken in the discovery, of which a full account was given in the *Builder* a fortnight ago (p. 60).

Electric Lighting at Hatfield House.—On the occasion of the county ball given by the Marchioness of Salisbury at Hatfield House on the 6th inst., the following arrangements were made for the lighting by electricity of the house and grounds. The principal rooms, galleries, and grand staircase were illuminated by upwards of 900 Swan's 20-candle-power lamps, the principal power for these lamps being derived from two water-wheels on the river Lea, which is a mile and a quarter distant from the house. The machinery used for generating the current consisted of two Siemens alternating machines, one sixteen-light "Brush" and one Siemens direct current machine, the latter being driven by a 16-horse-power Otto gas engine. The terraces and approaches to the house were lighted by six Clark-Bowman arc lamps, the current for these being supplied by an H. Gramme machine, driven by a traction-engine near the house. The lighting was in every respect a thorough success, and gave great satisfaction, there being not the slightest interruption to the working during a period of sixteen hours. The whole installation was carried out by Mr. Shillito. It may be remembered by our readers that the Marquess of Salisbury has been a pioneer in the matter of electric lighting and the use of electricity, and that his lordship has utilised this agent in a variety of novel ways by the transmission of electrical power, such as for grinding corn at farms situated at some distance from the water-power, pumping water and driving the ventilating apparatus at the house, driving the lathes and saws in the workshops, pile-driving, dredging, and cutting weeds in the river, &c.

Lectures on Sculpture and Architecture at the Royal Academy.—The following lectures on Sculpture will be delivered by Mr. A. S. Murray to the students of the Royal Academy of Arts on the dates mentioned, viz.:—"Early History of Bas-Relief," Thursday, Jan. 28; "Principles of Bas-Relief as observed in the best age of Greece," Monday, Feb. 1; "Later History of Bas-Relief in Greece," Thursday, Feb. 4; "Bas-Relief in Rome," Monday, Feb. 8; "The School of Pasiteles in Rome," Thursday, Feb. 11; "A Comparison between Polykleitos and Lysippos," Monday, Feb. 15. In Architecture, the following lectures have been arranged for, viz.,—By Mr. G. F. Bodley, A.R.A.:—"English Architecture of the Middle Age," Thursday, Feb. 18. By Mr. G. Aitchison, A.R.A.:—"Architectural Education," Monday, Feb. 22; "Mouldings," Thursday, Feb. 25; "Style and Composition," Monday, March 1. By Mr. W. Watkiss Lloyd:—"On the Theory of Proportion in the Arts generally, and particularly in Architecture," Thursday, March 4; "An Exposition of the Theory of Proportion in Architecture as understood and applied in detail by the Architect of the Parthenon," Monday, March 8.

Tilbury Docks Arbitration.—This arbitration, which was commenced in July, 1884, reached its sixty-seventh sitting on Saturday last. The proceedings arose out of the original contract for the construction of the new Tilbury Docks, Sir F. Bramwell, President of the Institution of Civil Engineers, being the arbitrator, assisted by Mr. J. A. Radcliffe, as legal assessor. Messrs. Kirk & Randall, the original contractors for the works, are the Plaintiffs; and the East and West India Docks Company are the Defendants. The amount claimed by the contractors is over 600,000*l*. The Attorney-General (Sir R. Webster, Q.C., M.P.), Mr. J. Fletcher Moulton, Q.C., M.P., Mr. C. A. Cripps, and Mr. R. Wallace are counsel for the plaintiffs; the Docks Company being represented by Mr. E. H. Pollard, Mr. Kenelm Digby, and Mr. Mildmay. The plaintiffs concluded their case at the sixty-third sitting, about forty having been occupied by the Dock Company's counsel in cross-examination of the plaintiff's witnesses. Three of the last four days were taken up by the Dock Company's Counsel with arguments on legal points arising out of the plaintiffs' case. The arguments the arbitrator (without calling on the plaintiffs to reply) disposed of on Saturday last by a decision adverse to the Dock Company's contentions upon all the points raised by their counsel, whom he then called upon to proceed with the case. This the Dock Company declined to do, on the ground that they propose forthwith appealing to the Divisional Court against the arbitrator's ruling, for which application Sir Farrer Herschel, Q.C., is retained.

Constantinople.—The church built at Constantinople by the Society for the Propagation of the Gospel in Foreign Parts (the funds for which were raised by contributions from all classes of the British nation), in memory of the British soldiers who fell during the Crimean War, has just had the east wheel-window filled with stained glass. The centre circle contains the head of Christ, after Guido Reni, the outer lights representing the Apostles and the symbols of the four Evangelists. There are two depressed circles under the window, which are filled with mosaics, representing the heads of St. Paul and St. Matthias. The whole has been designed and executed by Messrs. Mayer & Co., at a cost of 280*l*.

Messrs. Doulton's New Buildings.—We understand that Messrs. Doulton & Co. and Messrs. Young & Co., after obtaining tenders from several builders for the erection of factories, &c., are carrying out the work themselves.

Nineteenth Century Art Society.—Monday, the 25th inst., has been appointed for the reception of Works of Art intended for the Spring Exhibition of the Nineteenth Century Art Society, at the Conduit-street Galleries.

Institute of Builders.—The Annual General Meeting of the Institute of Builders will be held at the Offices on the 19th instant at two o'clock p.m.

Ainstable.—A three-light Munich stained-glass window has just been erected in Ainstable Church, near Carlisle, representing in the centre light the Ascension, and the side lights containing the scenes of Bazillai entertaining King David and Mnason lodging the Apostles. The work has been designed and carried out by Messrs. Mayer & Co.

Table Ware from Slag.—An American contemporary reports that the slag resulting from the smelting of copper, gold, and silver ores at Argo (Colorado) is now being used for the manufacture of beautiful table ware. The colours, are a kind of spray of onyx and opal flushed in waves throughout the ware. The colours, it is stated, are under perfect control, the slag containing a larger percentage of material necessary than can be found in slag elsewhere. The slag is melted at an intense heat, then poured into vats of agitated water, then re-melted, and poured into moulds either with or after an acid mixture, which causes the metal to flux pretty generally with added materials. The result is said to be a metallic glass with the strength of light cast-iron, which may be moulded into any form of table ware,—bowls, cups, tumblers, &c.,—with the most beautiful sprays of onyx stone colours upon a general background of opal.—*Iron.*

Royal School of Mines.—Prof. Warington Smyth, F.R.S., in continuing his lectures on mining in the Theatre of the Geological Museum, Jermyn-street, considered the various prejudices which have long existed in the minds of miners forming various schools of opinion of a very remarkable kind. Some men considered that lodes are more likely to occur on those hill-sides facing the sun or a large body of water; a few believe that plants and trees have a special liking for particular classes of mineral, and this fact may be considered as being reliable indications of favourable localities; a number place confidence in the manner in which snow lies upon the ground, believing that it will not lie on the backs of the lodes in the same way as in the country around because of a greater temperature in that particular part, owing to the presence of decomposing pyrites; the difference in the colour of grass is considered another indication; and, lastly, there is an opinion held pretty largely in some districts, though not sufficiently appreciated in others, that the position of some classes of lode may be found by a tolerably acute sense of smell, the presence of pyrites giving rise to sulphurous acids and other gases. He had noticed this peculiarity in connexion with lodes in the county of Wicklow, in the west of the county of Cork, and in Cornwall, where the odour is especially noticeable when the sun was shining brightly after a tolerably heavy shower of rain. Further, on the backs of certain lodes, in particular conditions of weather, a series of corruscations of light may be seen playing like a lambent flame. This has led to the discovery of lodes. It was a common thing to see these phenomena on Wheal Buller, thirty or forty years ago, but they have ceased since the lodes were exhausted. The explanation is to be found in the decomposition and recomposition which are known to be going on in the surface of these lodes, and especially to the occurrence of phosphates and arsenates. In conclusion, he referred to the popularity which the "divining rod" has obtained in various places, for the discovery of lodes. It is a forked twig, held in a certain position in the hands while walking over the country when the pointer is supposed to go down on the approach of a lode.

PRICES CURRENT OF MATERIALS.

TIMBER.	£.	s.	d.	£.	s.	d.
Greenheart, B.G. ....ton	6	10	0	7	10	0
Teak, E.I. ....load	12	10	0	15	10	0
Sequoia, U.S. ....ft. cube	0	2	6	0	2	9
Ash, Canada ....load	3	0	0	5	0	0
Birch "	3	0	0	4	10	0
Elm "	3	10	0	5	0	0
Fir, Dantsic, &c.	1	10	0	4	10	0
Oak "	3	0	0	5	0	0
Canada	6	0	0	7	0	0
Pine, Canada red	3	0	0	4	0	0
" yellow	3	15	0	5	5	0
Lath, Dantsic ....fathom	4	10	0	6	0	0
St. Petersburg	5	0	0	7	0	0
Wainscot, Riga....log	2	15	0	4	10	0
" Odessa	3	12	6	3	15	0
Deals, Finland, 2nd and 1st...std. 100	7	10	0	8	10	0
" 4th and 3rd	6	0	0	7	10	0
Riga	6	0	0	8	0	0
St. Petersburg, 1st yel.	9	0	0	15	0	0
" 2nd "	7	0	0	8	15	0
" white	8	0	0	10	10	0
Swedish	6	0	0	15	10	0
White Sea	8	0	0	18	0	0
Canada, Pine 1st	17	0	0	31	10	0
" 2nd	12	0	0	17	10	0
" 3rd, &c.	7	0	0	10	0	0
" Spruce 1st	9	0	0	12	0	0
" 3rd and 2nd	6	0	0	8	0	0
New Brunswick, &c.	5	0	0	7	0	0
Battens, all kinds	4	0	0	12	0	0
Flooring Boards, sq. 1 in.—Prepared, first	0	9	0	0	13	0
Second	0	7	6	0	8	6
Other qualities	0	5	0	0	7	0

TIMBER (*continued*).	£.	s.	d.	£.	s.	d.
Cedar, Cuba....foot	0	0	3½	0	0	4
Honduras, &c.	0	0	3	0	0	4
Australian	0	0	3	0	0	3½
Mahogany, Cuba	0	0	5	0	0	7½
St. Domingo cargo av.	0	0	5½	0	0	7½
Mexican "	0	0	4	0	0	5
Tobasco cargo av.	0	0	4	0	0	6½
Honduras cargo av.	0	0	4½	0	0	6½
Maple, Bird'seye	0	0	3½	0	0	6
Rose, Rio ....ton	7	0	0	18	0	0
Bahia	6	0	0	14	0	0
Box, Turkey	5	0	0	18	0	0
Satin, St. Domingo ....ft.	0	0	0	0	0	0
Porto Rico	0	0	0	0	0	0
Walnut, Italian	0	0	4	0	0	5

METALS.						
Iron—Pig in Scotland ....ton	2	2	6	0	0	0
Bar, Welsh, in London	4	15	0	5	0	0
" " in Wales	4	7	6	4	10	0
" Staffordshire, London	5	15	0	7	0	0
Sheets, single, in London	7	10	0	9	0	0
Hoops "	6	5	0	7	5	0
Nail-rods "	5	15	0	7	0	0
Copper—						
British, cks. and ingt. ....ton	43	0	0	44	0	0
Best selected	45	0	0	46	0	0
Sheets, strong	53	0	0	0	0	0
" India	48	0	0	48	10	0
Australian, fine cash	0	0	0	0	0	0
Chili, bars "	40	2	6	40	10	0
Yellow Metal....lb.	0	0	4½	0	0	4½

METALS (*continued*).	£.	s.	d.	£.	s.	d.
Lead—Pig, Spanish	12	10	0	0	0	0
English, com. brands	12	17	6	0	0	0
Sheet, English	13	15	0	13	0	0
Spelter—						
Silesian, special ....ton	15	2	6	15	5	0
Ordinary brands	14	17	6	15	0	0
Tin—						
Banca	98	0	0	0	0	0
Billiton	94	0	0	0	0	0
Straits	92	2	6	92	12	6
Australian	92	2	6	92	12	6
English ingots	97	0	0	0	0	0
Zinc—						
English sheet	0	0	0	0	0	0

OILS.						
Linseed ....ton	19	5	0	19	15	0
Cocoanut, Cochin	29	10	0	30	0	0
Ceylon	26	0	0	0	0	0
Copra	14	10	0	16	0	0
Palm, Lagos	29	10	0	0	0	0
Palm-nut Kernel	25	0	0	0	0	0
Rapeseed, English pale	23	0	0	0	0	0
" brown	21	5	0	21	10	0
Cottonseed, refined	17	10	0	19	0	0
Tallow and Oleine	25	0	0	40	0	0
Lubricating, U.S.	7	0	0	10	0	0
" Refined	4	0	0	12	0	0
Turpentine—						
American, in cks. ....cwt.	1	6	9	1	7	0
Tar—Stockholm ....brl.	0	19	0	0	19	6
Archangel	0	12	0	0	12	6

CONTRACTS AND PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Steam Roller	Chiswick Local Board	*Official*	Jan. 20th	ii.
Rebuilding, &c., Old Palace, Lincoln		Ewan Christian	Jan. 21st	xiii.
Wharf, New Dock Wall and Sewage Works...	Plymouth U.S.A.	G. D. Bellamy	Jan. 23rd	ii.
Earthenware Sewer-Pipes, &c.	Belfast Town Council...	J. C. Bretland	Jan. 26th	ii.
Construction of Tunnel	Leeds Cor. Waterworks	Filliter & Rofe	do.	ii.
Repairing, &c., Street Lamps	Tottenham Local Board	— De Pape	do.	xiii.
Kerbing, Tar-paving, &c., Work	Lewisham Brd. of Wks.	*Official*	do.	xiii.
Drainage Works	Walthamstow Sch. Bd.	do.	do.	ii.
Rebuilding External Wall	Guardians St. Leonard, Shoreditch	F. J. Smith	Jan. 27th	ii.
Articles and Works	Chelsea Vestry	G. R. Strachan	Jan. 28th	ii.
New Lunatic Asylum	Derby Corporation	B. S. Jacobs	Jan. 30th	ii.
Watering and Cleansing	Com. of H.M. Works...	*Official*	Feb. 1st	ii.
Sewerage Works	Bexhill Local Board	H. B. Nichols	do.	xiii.
Construction and Extension of Reservoirs	Stockton, &c., Water Bd.	J. Mansergh	Feb. 2nd	ii.
Boundary-Walls, Abutments, &c., for Bridge	Colne and Marsden L. B.	H. Bancroft	do.	ii.
Ironwork for Bridge	do.	do.	do.	ii.
New Post-Office, Carnforth	Com. of H.M. Works...	*Official*	Feb. 5th	ii.
Ironwork for Bridges	Midland Railway Co.	A. A. Langley	do	ii.
Waterworks	Northampton Cor.	T. & C. Hawksley	Feb. 19th	xiii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
District Surveyor	Met. Board of Works	Not stated	Jan. 27th	xvi.
Surveyor	Ulverston Local Board	200*l.*	Jan. 25th	xvi.

TENDERS.

BRISTOL.—For Castle Schools, Bristol, for the Bristol School Board. Mr. Stuart Colman, architect, Chancery-lane, London:—

J. Wilkins	£8,700 0 0
T. Brown	8,000 0 0
W. Williams	7,976 0 0
J. E. Davies	7,875 0 0
H. A. Forse	7,838 0 0
Perrott	7,795 0 0
R. Wilkins	7,780 0 0
T. R. Lewis	7,746 0 0
W. Corolin & Son	7,700 0 0
E. C. Howell	7,650 0 0
H. J. Rossitor	7,470 0 0
G. Humphreys	7,370 0 0
Stephens & Bastow	7,199 0 0
W. Church	7,150 0 0
A. J. Beaven (accepted)	6,995 0 0

EXETER.—For alterations and additions to premises lately occupied by Post-office Authorities, for Messrs. Peters & Hamlin, merchants. Messrs. Wilkinson & Warren, architects and surveyors:—

W. Gibson	£1,009 0 0
Holmes & Pomeroy	925 0 0
J. R. Gibbard	727 0 0
Vicary & Son	725 0 0
H. Phillips	653 0 0
Scadding & Son (accepted)	650 0 0

[All of Exeter.]

Stonework.

R. Mitchell (accepted). No competition.

EXETER.—For alterations and additions to 139, Fore-street, Exeter, for Mr. J. Lethbridge. Messrs. Wilkinson & Warren, architects and surveyors, Exeter:—

		B.
Scadding & Son	£300 0 0	£308 0 0
J. G Stephens	287 0 0	293 10 0
J. R. Gibbard	270 0 0	268 0 0
W. Gibson	265 0 0	273 0 0
Vicary & Son	260 0 0	280 0 0
W. R. Commings	243 0 0	257 0 0
W. H. Gooding *	242 0 0	255 0 0

* Accepted.

[All of Exeter.]

"B."—Alternative estimate for boarding to walls in lieu of plaster.

GREENWICH.—For alterations to the Mitre Tavern, London-road, Greenwich, for Mr. Burgess:—

Jas. A. Taylor (accepted)	£235 0 0

LAMBETH.—For alterations and additions at Lambeth Workhouse, Renfrew-road, for the Guardians of the Poor of the Parish of Lambeth. Mr. Thos. W. Aldwinckle, architect, East India-avenue, Leadenhall-street. Quantities supplied:—

Ede, Francis, & Son	£11,387 0 0
Wm. Downs	6,747 0 0
Wm. Smith	6,711 0 0
Kirk & Randall	6,685 0 0
Mark Gentry	6,450 0 0
J. & H. Mills	6,386 0 0
W. G. Wyatt & Co.	6,298 0 0
Oliver	6,155 0 0

LAMBETH.—For alterations and repairs at Lambeth Workhouse, Princes-road, for the Guardians of the Poor of the Parish of Lambeth. Mr. Thos. W. Aldwinckle, architect:—

Norris & Luke	£676 0 0
Riches	597 0 0
Wood, Harris, & Co.	570 0 0
Blandon	555 0 0
Wm. Smith	548 0 0
Seed	540 0 0
W. G. Wyatt & Co.	527 0 0
Calnan & Co.	514 0 0
Neave & Neave	480 0 0

LONDON.—For shops and chambers, Mount-street, London. Messrs. George & Peto, architects. Quantities supplied by Messrs. Stoner & Sons:—

Ashby Bros.	£10,750 0 0
Smith & Co.	10,741 0 0
Prestige & Co.	10,587 0 0
Boyce	10,570 0 0
Bywater	10,350 0 0
Hall, Beddall, & Co.	10,140 0 0
Simpson	9,898 0 0
Peto Bros.	9,643 0 0
Brass	9,593 0 0
Nightingale	9,580 0 0
Stephens & Bastow (accepted)	9,390 0 0

LONDON.—For alteration and repairs to the "Victory," Trafalgar-road, S.E.—

Mackey	£358 0 0
Parker	289 0 0
Bright & Co.	270 0 0
Beal	250 0 0
Rodwell	240 0 0
Wood, Harris, & Co., Rural Works, Clapham-road	230 0 0

LONDON.—For repairs to nineteen small houses at Camberwell, for Mr. Wm. Porter. Mr. R. Bennett, surveyor:—

Cannon	£265	0	0
Brass	200	0	0
Major	156	0	0
Ede & Son	138	14	0
Wood	135	0	0
Cattell	132	0	0
Lamprill	126	0	0
Marsden	125	0	0
King	123	0	0
Parsons	119	10	0
Chessell	117	0	0
J. Aldridge	106	0	0
Doughty	95	0	0
Stephens	87	0	0
Wilkinson	85	0	0
Cram	80	0	0
Blake	78	0	0
Riley Bros.	76	12	10
Riches	75	0	0
Waters	73	0	0
R. Seed	72	0	0
Ruth	70	0	0
Walker (accepted)	54	0	0

LONDON.—For alterations to 3, Park Prospect, Great Queen-street, Westminster, for Mr. C. B. Hurter. Mr. H. I. Newton, architect, Queen Anne's-gate:—

Heath, South Kensington	£443	0	0
Bywaters, Regent-street	430	0	0
Burman & Sons, Kennington	382	0	0
Marks, Paddington	330	0	0
Godden, Upper George-street, Bryanstone-square (accepted)	315	0	0

OLDHAM.—For the erection of "Salvation Army" Barracks, in Union-street, Oldham, for the Oldham Salvation Army Barracks Building Company, Limited. Mr. E. J. Sherwood, architect and surveyor, Queen Victoria-street, London. Quantities by the architect:—

Jackson & Randall, Oldham	£5,126	0	0
J. & S. Whitehead, Oldham	5,000	0	0
William Lees, Oldham	4,827	0	0
John Dyson & Sons, Oldham	4,784	0	0
Whitworth Whittaker, Oldham	4,760	0	0
R. W. Bird, Bradford, Manchester	4,740	0	0
Edward Stephenson, Oldham	4,730	0	0
Emanuel Whittaker, Oldham	4,710	0	0
C. Schofield & Co., Oldham	4,550	0	0
J. Whitehead, Failsworth, Manchester	4,450	0	0
R. Whitell, Blackley, Manchester	4,360	0	0
M. Holt, Cheetham, Manchester	4,331	0	0

[Architect's estimate, 4,315*l.*]

OXFORD.—For the erection of a temporary bridge over the Thames, near Osney Bridge, for the Oxford Local Board. Mr. W. H. White, M.Inst.C.E., engineer:—

C. Bossom, Oxford (accepted)	£477	14	6

[There were three other Tenders.]

READING.—For the erection of new factory, Mill-lane, Reading, for Mr. E. Gibbons. Mr. W. Ravenscroft, architect. Quantities supplied by Messrs. H. Cooper & Sons, Maidenhead and Reading:—

J. Winter	£2,300	0	0
Strong Bros.	2,181	0	0
H. G. Lewis	2,100	0	0
G. Searle	2,060	0	0
J. H. Margetts	2,059	10	0
W. H. Woodroffe	2,040	10	0
J. C. Cook	2,025	0	0
J. Bottrell	1,987	0	0
Higgs & Sons	1,799	0	0

[All of Reading.]

STANSTEAD (Essex).—For new brewery at Stanstead, Essex, for Messrs. Rogers & Co. Mr. Arthur Kinder, architect, Lawrence Pountney-hill. Quantities supplied:—

	With Office.	Without Office.
Levey, Bishops Stortford	£981 0	£926 15
Sanders, Stanstead	974 15	927 15
Conwell, Bishops Stortford	890 0	854 0
Glasscock & Son, Bishops Stortford	889 10	848 0
Dix, Saffron Walden	873 0	827 0
J. & A. Franklin, Bishops Stortford and Dunmow	818 8	772 19
Bunting, St. Ives	750 0	707 0
Harbrow, London	741 0	710 0

TOTTENHAM.—For constructing a 3-ft. 6-in. by 2-ft. 4-in. sewer, from High-road along Lordship-lane to Jolly Butcher's-hill, Wood-green, for the Tottenham Local Board of Health. Mr. W. A. H. De Pape, engineer:—

L. Bottom, Battersea	£15,644	0	0
J. Pizzey, Hornsey	13,300	0	0
W. Nicholls, Wood-green	11,879	0	0
J. W. & J. Neave, Leytonstone	11,664	10	3
W. Cunliffe, Barking	11,544	0	0
C. Dickinson, Loughborough Junction	11,336	12	9
John Oliver, Coldharbour-lane	11,125	0	0
B. Cooke & Co., Battersea	10,978	0	0
C. Killingback, Camden Town	10,495	0	0
G. Bell, Tottenham Wharf	10,410	3	6
G. Neal, Wandsworth-common	10,168	0	0
J. Edmonson, Lower Edmonton	10,040	1	3
Wilkinson Bros., Finsbury Park	9,967	0	0
Thos. Adams, Moorgate-street	9,295	10	10
J. Bloomfield, Tottenham	8,164	18	8

[Engineer's estimate, 10,153*l.*]

SPECIAL NOTICE.—Lists of Tenders frequently reach us too late for insertion. They should be delivered at our office, 46, Catherine-street, W.C., *not later than Four p.m.* on THURSDAYS.

TO CORRESPONDENTS.

Registered Telegraphic Address, "THE BUILDER, LONDON."

R. R. R. (next week).—W. and W. (one of the Tenders sent in below our mark. We publish nothing under 100*l.*).—A. M. P. (photograph received).—A. E. A.—W. M. P. & E. C. Co. (amount not sent).—W. E. (too late).—H. D. (thanks).—P. & Co. (mentioned last week).

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and not to the Editor.

PUBLISHER'S NOTICES.

Registered Telegraphic Address, "THE BUILDER, LONDON."

THE INDEX and TITLE-PAGE for Volume XLIX. (July to December, 1885) was given as a Supplement with our issue of January 9th.

A COLOURED TITLE-PAGE may be had, gratis, on personal application at the Office.

CLOTH CASES for Binding the Numbers are now ready, price 2s. 6d. each; also

READING CASES (Cloth), with Strings, to hold a Month's Numbers, price 2s. each; also

THE FORTY-NINTH VOLUME of "The Builder" (bound), price Twelve Shillings and Sixpence.

SUBSCRIBERS' VOLUMES, on being sent to the Office, will be bound at a cost of 3s. 6d. each.

CHARGES FOR ADVERTISEMENTS.

SITUATIONS VACANT, PARTNERSHIPS, APPRENTICESHIPS, TRADE, AND GENERAL ADVERTISEMENTS.

Six lines (about fifty words) or under ..... 4s. 6d.
Each additional line (about ten words ..... 0s. 6d.

Terms for Series of Trade Advertisements, also for special Advertisements on front page, Competitions, Contracts, Sales by Auction, &c. may be obtained on application to the Publisher.

SITUATIONS WANTED.

FOUR Lines (about THIRTY words) or under ..... 2s. 6d.
Each additional line (about ten words) ..... 0s. 6d.

PREPAYMENT IS ABSOLUTELY NECESSARY.

*** Stamps *must not* be sent, but all small sums should be remitted by Cash in Registered Letter or by Money Order, payable at the Post-office, Covent-garden, W.C. to

DOUGLAS FOURDRINIER, Publisher,
Addressed to No. 46, Catherine-street, W.C.

Advertisements for the current week's issue must reach the Office before THREE o'clock p.m. on THURSDAY.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c. left at the Office in reply to Advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

SPECIAL.—ALTERATIONS in STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same, must reach the Office before TEN o'clock on WEDNESDAY mornings.

PERSONS Advertising in "The Builder," may have *Replies addressed to the Office, 46, Catherine-street, Covent Garden, W.C. free of charge.* Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage.

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom at the rate of 19s. per annum PREPAID. To all parts of Europe, America, Australia, and New Zealand, 26s. per annum. To India, China, Ceylon, &c. 30s. per annum. Remittances payable to DOUGLAS FOURDRINIER, Publisher, No. 46, Catherine-street, W.C.

Best Bath Stone, for Winter use.
WESTWOOD GROUND,
Box Ground,
Combe Down,
Corsham Down, and Farleigh Down. { Summer / Dried.
RANDELL, SAUNDERS, & CO., Limited,
Corsham, Wilts. [ADVT.

Box Ground Stone
is the best for use in all exposed positions being a well-known and tried Weather Stone.
50,000 ft. cube in stock.
PICTOR & SONS,
BOX, S.O., WILTS. [ADVT.

Doulting Freestone.
THE CHELYNCH STONE. The stone from these quarries is known as the "Weather Beds," and is of a very crystalline nature, and undoubtedly one of the most durable stones in England.
THE BRAMBLEDITCH STONE. Is of the same crystalline nature as the Chelynch Stone, but finer in texture, and more suitable for fine moulded work.
HAM HILL STONE.
Greater facilities have been provided for working these quarries, and the stone can be supplied in large quantities at short notice.
Prices, and every information given, on application to CHARLES TRASK & SONS, Norton-sub-Hamdon, near Ilminster, Somerset.
London Agent—Mr. E. WILLIAMS,
16, Craven-street, Strand, W.C. [ADVT.

Doulting Free Stone
HAM HILL STONE,
BLUE LIAS LIME
(Ground or Lump),
For prices, &c., address S. & J. STAPLE, Quarry Owners, Stone and Lime Merchants, Stoke-under-Ham, Ilminster. [ADVT.

Ham Hill Stone! Ham Hill Stone!!!
For Ham Hill Stone of best quality and workmanship, apply to JOHN HANN & SON, Quarry Owners, Montacute, Ilminster. Established 1837. Agents, MATTHEWS & GEARD, Albany Wharf, Regent's Park Basin, N.W. [ADVT.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 38, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds, and milk-rooms, granaries, tun-rooms, and terraces. [ADVT.

Asphalte.
Seyssel, Patent Metallic Lava, and White Asphaltes.
M. STODART & CO.
Office:
No. 90, Cannon-street, E.C. [ADVT.

EVERY DESCRIPTION OF SEASONED WOODS AND VENEERS IN EXTENSIVE QUANTITIES.
B. J. HUDSON & SONS,
Millbank Sawmills, Grosvenor-road, S.W.;
Whitfield-street, W.;
And Store-street, London, W.C.
Telephone No. 3,152, and Private Wire connecting Business Premises.

BANNER VENTILATORS.

The Strongest Exhaust Ventilators for all Buildings, Public Halls, Churches, Billiard-Rooms, &c.

HIGHEST PRIZES at all the most important Exhibitions.

BANNER SYSTEM OF SANITATION AND SANITARY APPLIANCES
WERE AWARDED AT THE
International Health Exhibition, 1884, One Gold Medal, Three Silver Medals, and One Bronze.

For further Particulars and Prices apply to
BANNER BROS. & CO. Sanitary and Ventilating Engineers,
11, BILLITER SQUARE, LONDON, E.C.